(Second Series) Vol. 2.—No. 1.

Western Australia.

JOURNAL

Of THE

DEPARTMENT OF AGRICULTURE

OF

WESTERN AUSTRALIA.

By Direction of

The HON. THE MINISTER FOR AGRICULTURE.

PUBLISHED QUARTERLY.

MARCH, 1925.

PERTH:
BY AUTHORITY: FRED. WM. SIMPSON, GOVERNMENT PRINTER.
1925.

R 8939/25.

Still Australia's Strongest Windmill

THE

SAMSON

Still pre-eminent; still the most serviceable; still the only double-geared Mill fitted with the famous Hyatt Roller Bearings.

Let the Samson Solve Your Water Problem.

The SAMSON is what its name implies—the strongest Mill in the World. Actual tests have demonstrated the fact that Samson Windmills equipped with Hyatt Roller Bearings pump 28 per cent. more water in the same breeze than those with plain bearings.

Write or call for Catalogue.

Harris Scarfe & Sandovers,

LIMITED,

HAY STREET, PERTH.

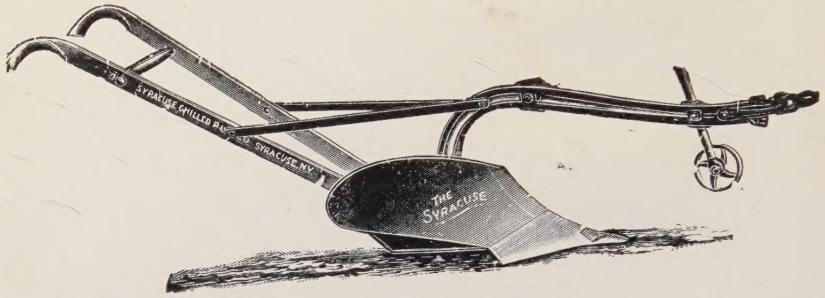
CONTENTS.

		Page
THE AGRICULTURAL COLLEGE		7
CEREAL SMUTS	W. M. Carne	10
A SIMPLE PICKLER	G. L. Throssell	20
BURT'S EARLY OATS		21
BRANDING THE WOOL BALE	Geo. L. Sutton and N. Davenport	23
POULTRY NOTES AND STICKFAST FLEA	R. A. Dusting	33–35
THE GARDEN—SEASONAL NOTES		36
CABBAGE AND CAULIFLOWER	H. D. Larwood	37–39
CULTIVATION OF THE POTATO	G. N. Lowe	41
HORTICULTURAL NOTES	Geo. W. Wickens	43
NEW POTATO REGULATIONS		45
BLASTOPHAGA FIG WASP	L. J. Newman	46
WELL VENTILATED HOUSES		48
FRUIT FLY BAIT (WARNING)	L. J. Newman	49
PASTURES—TOP DRESSING EXPERIMENTS	G. K. Baron-Hay	51
CELLAR AND VINEYARD NOTES	H. K. Johns	64
A RECORD AGED HOLSTEIN PRODUCER		65
SEED TREATMENT FOR OAT SMUT	W. M. Carne	65
THORN APPLE	W. M. Carne	67
POISONING TREES AND BLACKBOYS WITH ARSENIC	P. H. Harper	69
LAYING NATURAL FOR A GOOD HEN		70
THE ZAMIA PALM AND ITS DESTRUCTION	A. B. Adams	71
DAIRY COWS AND SALT		74
THE DEVELOPMENT OF A DAIRY HERD—TESTING AND CULLING		75
REPAIRING CONCRETE WALLS		88
DAIRY HERD IMPROVEMENT	P. G. Hampshire	88
FLAX CULTIVATION		91
OFFICIAL HERD TESTING RESULTS		92
REGULATIONS UNDER THE STOCK DISEASES ACT		93
CLUSTER CLOVER	W. M. Carne, C. A. Gardiner and A. B. Adams	95
LOCUSTS	L. J. Newman	97
CONCERNING FOXES	C. J. Craig	98
EXTERNAL PARASITES OF SHEEP	L. J. Newman	99
SHEEP LOUSE	H. McCallum	108
ERADICATION OF LICE AND TICK IN SHEEP	F. Murray-Jones	112
PURE BRED BULL'S ARITHMETIC		113
DENTITION OF SHEEP	H. McCallum	114
FARMERS FIELD TRIALS	H. Rudall	117
FARM IRRIGATION	A. R. C. Clifton	121
ROYAL WHEAT CROP COMPETITIONS—ZONE CHAMPIONSHIPS	Geo. L. Sutton	123
FIELD EXPERIMENTS—CHAPMAN EXPERIMENTAL FARM	I. Thomas	129
FIELD EXPERIMENTS—MERREDIN EXPERIMENT FARM	J. H. Langfield	133
FOREST PESTS—PIN-HOLE BORER	J. Clark	138
METEOROLOGICAL INFORMATION		143
LIVE STOCK AND MEAT RETURN		144
MARKET REPORT—WHEAT AND CHAFF		145

FOY & GIBSON

PTY. LTD.

FOR SUPREME VALUE IN FARM IMPLEMENTS, ETC.



SYRACUSE PLOWS

WOOD BEAM, No. 50L, VERY LIGHT ONE HORSE ..	£4 5 0
WOOD BEAM, No. 51L, LIGHT ONE HORSE	£4 15 0
WOOD BEAM, No. 52L, MEDIUM ONE HORSE	£6 0 0
WOOD BEAM, No. 53L, ONE OR TWO HORSE	£6 15 0
STEEL BEAM, No. 5/78, ONE HORSE	£4 15 0
STEEL BEAM, No. 403, LIGHT TWO HORSE	£7 10 0
STEEL BEAM, No. 402, MEDIUM TWO HORSE	£8 10 0

Syracuse Spike Teeth Lever Harrows, 30 Teeth to Section, Width of Cut 4ft. 9in., One Section £4 15s. 0d., Two Sections £9.

Empire Steel Frame Expanding Cultivators, Five 3in. Points, Wing Points, Shovel Points, Lever Wheel, and Rear Wheel, Depth Regulator, £5.

Expanding Cultivators, 14 Teeth, £3 15s.

Earth Scoops, No. 2, 5 cub. feet, £5 17s. 6d., No. 1, 7 cub. feet, £6 2s. 6d.; No. 2; 9 cub. feet, £8 10s.

Buffalo Drilling Machines, Automatic Feed. £2 17s. 6d.

Buffco Forges, £3 15s.

Garden Barrows, No. 1, £1 17s. 6d.; No. 2, £2 2s. 6d.

JUMBO ENGINES fitted with Webster Oscillating Magneto (High Tension). No Batteries required.

1¾ H.P. £25. 3 H.P. £37 10s. 5 H.P. £55. 7 H.P. £85.

We carry stocks of Spare Parts for these Engines.
Also, Syracuse Farm Implements.

HAY ST. AND ST. GEORGE'S TERRACE, PERTH

SKILLED SERVICE

The same reasons which lead a man to employ a lawyer, a physician or an architect, when he has need for the special services these men give, should impel him to turn to THIS COMPANY in all matters concerning Wills, Trusts, Agencies, Guardianships and the Administration of estates generally.

An interview places you under no obligation.

THE WEST AUSTRALIAN TRUSTEE
EXECUTOR AND AGENCY CO., LTD.

EDMUND S. BARKER, MANAGER.

NEW ADDRESS:

135 ST. GEORGE'S TERRACE, PERTH.

Value of Trust and Agency Funds now exceeds £3,600,000.

"THE JOURNAL OF AGRICULTURE"

will be supplied free *on application* to any person in the State who is following Agricultural, Horticultural, or Viticultural pursuits, to Agricultural Societies or Associations, and to any person otherwise interested in Agriculture.

A charge of Threepence per copy will be made for the *Journal* to persons other than the foreging, or who do not reside in the State. These applications, accompanied by the requisite amount, must be forwarded to the Direactor of Agriculture, Department of Agriculture, who will also receive all correspondence dealing with the conduct of the *Journal.*

Editors of agricultural and country papers are invited to reproduce any of the articles contained in this *Journal,* providing the usual acknowledgment is made.

If you are not receiving the *Journal,* which is issued quarterly, and wish to do so, please forward your name and postal address to the Director of Agriculture, Perth.

MASSEY-HARRIS

New Style

DRILL

Equipped with Poles and Trees or with Fore Carriage

The Best
for accurate sowing of both grain and fertiliser
See It!

The Very Latest
Great Strength combined with light draft.
See It!

Massey-Harris Company Limited
360 Murray Street, Perth

JOURNAL

OF THE

Department of Agriculture

OF

WESTERN AUSTRALIA.

Vol. 2. (Second Series) MARCH, 1925. No. 1.

THE AGRICULTURAL COLLEGE.

The decision of the Government to establish an Agricultural College in this State will receive the ready approbation of every right-thinking person who has the welfare of Western Australia at heart. The avowed objects of the institution are in themselves a guarantee of benefits to be bestowed on the present and future generations. Summarised, they are, under proper guidance, to bring the pastoral, dairying, wheat and fruit-growing industries to the highest degree of efficiency, and this consummation achieved—for failure is inconceivable—our portion of this great Commonwealth must attain that eminence of production to which its vast areas and splendid geographical features entitle it.

During the past two decades agriculture in this State has progressed to an extent not hitherto deemed realisable. For many years development followed on lines of caution rather than enterprise; at least in so far as our wheat belt is concerned. The suitability of our soil was never in question, but with millions upon millions of acres situated in light-rain zones the problem of successful grain production involved risks calculated to curb enthusiasm.

When in 1910-11 the Government of the day placed numbers of settlers on the land East of Northam, now known as the Dowerin-Merredin loop, that forward movement was followed by such a disastrous season that many pessimists were found joining in the strident chorus of "I told you so," and ready to attribute dementia to those who boldly held that the State would yet become a great grain producer. But the seers never lost faith. The agricultural scientist and those whose responsibility it was to give proper guidance towards high efficiency held steadily to their task, and did not waver because of adverse fortune at a critical stage. They counselled perseverance, preserving that cheery optimism that infuses fresh courage in the faltering. They did more. They engaged in an active campaign of experiment, supervision, and instruction. They brought to the embryo farmer a ready-made

experience and saved the individual that discouraging loss of time and money in acquiring by trial and error the knowledge requisite to carry on his avocation. Under these virile methods our cultivable zones reached farther and farther into the sub-arid regions as the potency of moisture conservation by fallow and manurial aids became more widely demonstrated. To-day there are no croakers. The sun rises on a new inheritance, and we know that the limit of our harvests cannot yet be measured in acres.

But there is another aspect of the industry that demands attention, and that is the yield from our land already under cultivation, and it is upon this feature that the staff of the College, so far as it deals with cereals, will have to concentrate attention.

Quick to realise the advantages to be gained by an increase in yield from our already cultivable areas, the Merchants Agricultural Research Committee has been formed with the object of raising £10,000, such sum to be invested in Government bonds, and the interest gained applied to the purpose of agricultural research at "Muresk." The Minister for Agriculture, Mr. Troy, in addressing the gathering which brought this fund into being, struck a true note when he told his hearers that the future mainstay of the State must lie in its agricultural and pastoral industry; and drew attention to the opinion expressed by Professor Richardson, of Victoria, that this State held the largest and safest wheat belt in Australia. Professor Shann, of the Perth University, in speaking to the same audience, emphasised the need for research to increase our productivity of the soil. He pointed out that the average for wheat lands throughout Australia for the five years ending 1913-14 was 11.9 bushels per acre. For the five years ending 1923-24 that average had risen (despite the fact that Western Australia had acted to some extent as a brake) to 12.51 bushels; a rise of .61 bushels for every acre put under crop. This increase was attained, too, during a period which included a season of complete drought in New South Wales and a partial drought in Victoria and South Australia. But what of Western Australia? For the five years ending 1913-14 our average was 10.86 bushels. For the five years ending 1923-24 our average was 10.41 bushels, a falling away of .45 bushels. Had our wheat farmers held their place and done as well as the Commonwealth as a whole, our average would have been 1.06 bushels per acre higher, equal to another 2,000,000 bushels, which at 6s. per bushel, would represent £600,000 for one year. Surely nothing could more clearly demonstrate the need for an Agricultural College where research work can be carried on under conditions favourable to our State.

It is but right to point out, however, that this year our experts estimate we are likely to realise a 12-bushel crop, and that despite a very dry September. This increased average will be largely due to the generally improved methods adopted throughout the State, and had it not been for these, very few of our early crops would have survived that dry period without material and serious loss.

But it is not only to our wheat farmers that the Agricultural College should strongly appeal. Its benefits will not be confined to any particular branch of the industry, nor will one branch be furthered at the expense of another. It is intended that its activities will extend to the general improvement of stock-raising, dairying, fruit-growing, and every phase of the land's production, except the conservation and reafforestation of our timber lands, already the care of another service. The initial aim of the College is said to be "to spread amongst farmers generally the better methods already in use by the best farmers." This is to be accomplished to a great extent by field days and other demonstrations of scientific methods to men on the land.

The College will provide tuition for different classes of students. Those from 16 years of age and upwards will be given a course of two years to complete their apprenticeship to farming, and help them to acquire a critical and scientific attitude towards its problems. These would make up the main body of students, and be admitted without entrance qualification other than their interest in the land. Then it would also comprise those taking a course in agricultural science with a view to fitting themselves for managerial positions in butter, cheese, and bacon factories, departmental inspectors, and allied occupations, as well as those taking the course of B.Sc. in Agriculture at the University, who would make use of the institution for practical and experimental work. In addition to all this the research work would provide a continuous source of information of great value for dissemination amongst pastoralists, dairy farmers, wheat farmers, orchardists, and others, and prove the greatest factor in progress.

We have increased our knowledge of cultivable areas. Let us increase the productivity of our soil. The establishment of the Agricultural College at "Muresk" will tend towards this, and mark an epoch in the agricultural history of the State. It is safe to say that as a result of this institution the wealth of the community will increase may fold through the application of science to agriculture. Science is an accumulation of facts. The College will gather proved facts and methods, making them known to every farmer who is sufficiently interested to seek the information. All this must follow the ideals set up by those responsible for the institution which is to be opened this year; ideals aptly summed up by a recent writer in the following words:—"The main function of the College in teaching students would be to act as a clearing house for the knowledge gained by successful farmers and others throughout the State, and applying scientific methods to our climatic and soil conditions . . . . . To do this an Agricultural College must keep in close touch with the work of scientific investigators elsewhere; otherwise there is a danger that its teaching will get into a groove. Contact with progressive ideas can best be maintained by keeping investigation and research constantly before the students. To do this some, at least, of the teaching staff should be enabled to devote their time to research, the most fruitful source of new methods and ideas, as Farrar's wheat-breeding has proved."

CEREAL SMUTS.

W. M. CARNE,
Botanist and Plant Pathologist.

The cereal smuts are of two types:—

1. *Flag Smuts.*—Represented in this State by Flag Smut of wheat and characterised by the production of smut on the leaves.

2. *Head Smuts.*—In these the ears or grains are affected. They may be divided into two groups according to the manner of infection.

(a) *Seedling Infecting.*—Represented here by Ball Smut or Bunt of Wheat, Oat Smuts, and Covered Smut of Barley.

(b) *Flower Infecting.*—Including Loose or Flying Smut of Wheat and Loose Smut of Barley.

FLAG SMUT OF WHEAT.

(*Urocystis tritici.*)

This disease has been dealt with fully in this Journal (June, 1924) and additional notes only are here included.

Probably owing to the lateness of the effective rains in 1924 the prevalence of this disease was much less than in 1923. No report of its occurrence in serious quantity was received. Late sowing or late germination are both unfavourable for flag smut.

The most striking observation which has been made during the past three or four years is the apparent resistance of Nabawa. We have no record of the disease occurring in that variety, even when grown in the same paddock with affected varieties. It has also been known to produce a clean crop when grown after one affected crop and before another affected crop in the same paddock. Pot trials last season with 11 varieties in which chopped affected straw was sown with the grain gave positive infection in all cases except Nabawa, Florence, and Yandilla King. On the evidence available farmers are strongly advised to sow Nabawa in paddocks which have previously carried a crop affected with flag smut.

BUNT, BALL SMUT OR STINKING SMUT OF WHEAT.

(*Tilletia levis and Tilletia tritici.*)

This disease, the most important of all the smuts, is a head smut infecting the plants in the seedling stage.

It will be noted that two fungi are quoted above as causing this disease. There are in fact two distinct diseases, but as the differences in the main are purely technical, the two may be treated as one. As a matter of fact *Tilletia levis* is much more common here than *Tilletia tritici*, which has only been noted by the writer twice in the past two years. There is a field difference between the two, the later causing a stunting of the affected plants not usually noticeable with the former.

Symptoms.—Bunt is characterised by the formation of smut or bunt balls in the ears instead of grains. Bunt balls (Fig. 1) are greyish-green, and readily distinguishable from wheat grains. They are usually shorter, stouter, and lighter in weight. They have a characteristic odour, very offensive, and suggesting decaying fish. When broken, they are found to contain a greasy black mass which readily breaks up into a fine powder.

Fig. 1.—Smut Balls.

Affected plants tend to be a darker green than clean plants. Affected ears (Fig. 2) are more open, the glumes or chaff of the spikelets (or sections of the ear) being spread apart by the bunt balls inside. Bunted plants tend to mature earlier than normal plants of the same variety. All the ears of a plant may be bunted. More frequently only a proportion, especially on secondary growths, are affected, and the remainder appear quite normal. Again bunt balls and sound grains sometimes occur in the same ear. A few cases have even been recorded in which portions only of individual grains have been smutted.

Loss due to Bunt.—The loss resulting from this disease is twofold in character:—

1. Bunted grains are valueless.

2. Sound grains containing bunt balls are depreciated both for seed or milling according to the amount present. No sane person will willingly plant

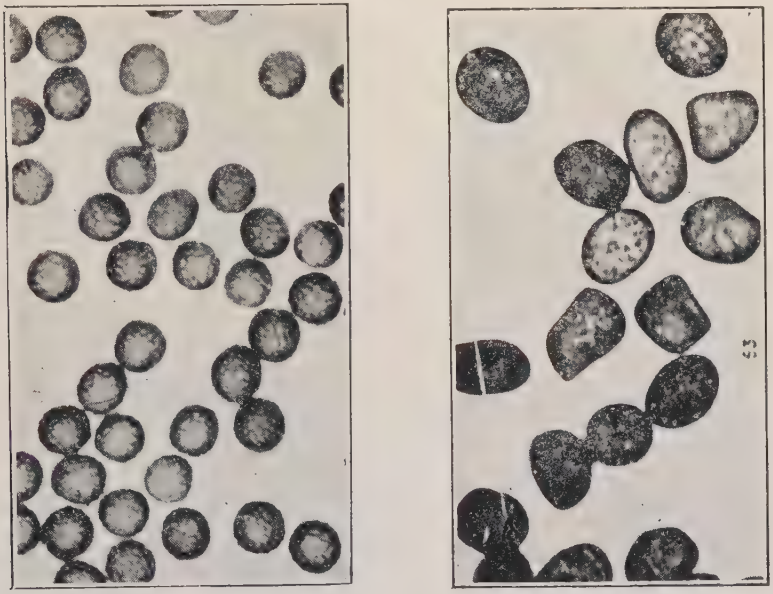
Fig. 2.—Ball or Stinking Smut or Bunt. (Smut free ear in centre.)

wheat obviously badly affected with bunt. For milling purposes bunted wheat is a nuisance. Its presence gives such a bad colour and bad odour to flour that the miller has to process and deodorise affected samples, and naturally he is not prepared to pay the price commanded by clean wheat. Badly affected samples cannot at reasonable cost be rendered fit for milling, and must find their way to the feed market. Were the bunt balls unbroken the

difficulties would be less, but in passing through the threshing drum of the harvesting machinery may of the balls are broken, and the fine black dust distributed over the sound grain. The principal loss to the farmer from bunt is therefore not the loss of grain but the dockage justifiably imposed on the good grain containing bunt balls.

The use of Bunted Grain for Feed Purposes.—The use of bunted wheat for feeding poultry and stock requires some care. If taken in large quantities bunt is poisonous, setting up gastric and intestinal troubles.

Development of the Disease.—As previously mentioned ball smut may be caused by either of two fungi. Their life histories are so similar that we may treat them as identical.



Tilletia tritici. Tilletia levis.

Fig. 3.—Spores of the two species of Ball Smut—highly magnified. (After McAlpine.)

Let us commence at harvest time in a crop containing smutted plants. When the grain is bagged it will contain smut balls. Many of the grains will certainly be dusted with the black smut powder. In passing through the threshing drum some of the bunt balls have been broken and the powder scattered through the wheat. One ball alone contains upwards of six million grains of this powder, so that there are plenty to go round. When well mixed up, unless the smut is very plentiful, its presence on the seed may pas unnoticed to the naked eye, as each little smut speck is microscopical in size. During the subsequent handling up to and during the drilling of the seed in a following season further opportunities may occur to break more smut balls and further distribute the smut dust amongst the grain. Each particle of the smut dust is a spore (*chlamydospore*) (Fig. 3), a structure correspond-

ing to a seed in ordinary flowering plants. Let us assume that no treatment is given to the seed, and that in due course it is sown with its accompanying smut spores. If the conditions are favourable both seeds and spores germinate. The spore pushes out a short growth (*promycelium*) at the end of which

Fig. 4.—The germination and development of a Smut Spore.
(After Tubeuf.)

is formed a cluster of thin spores (*conidia*), which unite in pairs. (Fig. 4). From each pair is produced a smaller sickle-shaped secondary conidium, and it again may produce another or tertiary conidium. Infection of the wheat plant takes place from delicate thread-like growths, from the secondary or

Fig. 5.—Various stages of germination of wheat during which infection by the spores of Ball Smut take place. (Ottawa Bull. 73. Drawings from Diagrams in Kensington Museum.)

tertiary conidia, which are able to attack the very earliest growth from the wheat grain. The young growth is open to attack from the commencement of germination of the grain until the first leaf commences to appear. (Fig. 5). The fungus grows internally in the plant keeping well up to the growing points. In due course the wheat flowers, the fungus enters the undeveloped

seed and occupies the whole of it. Later the fungus breaks up into innumerable black spores within the seed coat, thus forming bunt balls.

Some Notes on Bunt Infection.—While we know that the presence of smut spores is essential for the production of bunted wheat plants, or in other words that clean seed produces clean wheat, it is not always easy to explain why bunt occurs more or in one season than another or on one crop than another.

It is the practice at the State Experiment Farms to annually conduct tests of the resistance of various varieties of wheat to bunt. The actual fungus used is *Tilletia levis*. The following notes have been compiled by Mr. E. J. Limbourn, the officer in charge of such investigations at the Merredin Experiment Farm, and are the result of his observations over several years:—

"The seed used for this Smut Resistance Test is first thoroughly infected, the grains when planted being quite black with smut spores. After infection the grains are planted by hand in rows, each containing 100 grains of one variety, usually from a single plant. All varieties to be included in the test, whatever the period of maturity, are planted on the same day. Planting is deferred until after the first good rains, so that both grain and spores may germinate together, ensuring a maximum amount of infection. By planting all varieties at the same time no one variety or set of varieites has any advantage over another as far as condition of soil, cultivation, etc., are concerned. In spite of this some varieties show every year decidedly more resistance than others. Even with the most liable varieties there are always a few plants which mature only clean grain.

"From observations made it would appear that there are three main reasons for the difference in the resistance of different varieties. They are:—

1. A constitutional factor giving high resistance.
2. Climatic conditions, and
3. Soil conditions which in many cases are closely allied to or dependent on 2.

"*Constitutional Factor.*—It is a well known fact that some varieties are more resistant than others, a few such as 'Florence' being practically smut proof. It has also been proved that this resistance is an inherited factor, and by cross-breeding from resistant varieties new varieties can be formed equally resistant. There are now several unnamed varieties under test at the Experiment Farms equally as resistant as 'Florence.' From an examination of the grains of these resistant varieties it would seem that this factor of resistance is in some way related to the hard translucent quality of such grain. It will be found that all the highly resistant varieties have hard bright grains or are derived from varieties having that quality. 'Carabin' is a good instance of this, its parent varieties being 'Florence' and 'Cedar,' both of which have hard grains.

"*Climatic Conditions.*—There is little doubt that many, probably most, of the plants in the test are infected with the disease. It depends largely upon the climatic conditions whether this infection will result in the production of bunt balls. In 1922 we had a very variable season. May was very wet, June exceptionally dry, and then followed very fair rains in July. The test

was planted during May, and good growth was made with the wet weather. With the dry spell in June 'Florence,' a very early variety, began to send up ears prematurely. Then with the July rains there was considerable secondary growth. In the secondary growth bunt balls were found, the primary growth being quite clean. This again occurred in the later varieties in 1923. The September rains following the dry August caused secondary growth in these, and in many instances the only smut found was in the secondary growth. It is indeed always found that the secondary growth is more liable than primary. In 1924 conditions for infection were very good, and the test proved one of the most severe so far carried out. The very cool temperatures during the winter months and well into August resulted in very slow growth. With the dry period during July, and with the subsequent fairly good rains during August and September, there was considerable secondary growth, which carried the greatest number of affected heads. This applied more especially to the more resistant varieties.

"*The Condition of the Soil.*—Another thing that affects the occurrence of the disease is the presence of water-logged hard-setting patches of ground. It has been noticed that wherever plants are growing on hard patches or depressions where water had lain, they are not only stunted in growth but are also smutted. No matter how resistant the variety might be naturally, more or less of the ears contain smut balls."

All the facts concerning the occurrence of bunt are not known. The following information gathered from various sources will help to explain Mr. Limbourn's observations:—

Infection of wheat can only take place from the spores of either *Tilletia levis* or *Tilletia tritici*. The most favourable position of the spores for infection is on the seed when planted. The more spores on a seed the greater the chance of the resulting plant being smutted.

Spores germinate readily under favourable soil conditions. Kept dry they may survive in unbroken bunt balls for upwards of 12 years. In the soil, under Australian conditions, it is probable that few survive one year.

The optimum (best) temperature for spore germination is about 63 deg. F. Temperatures below 40 deg. and above 70 deg. are unfavourable to germination. The optimum temperature for wheat germination is about 77 deg., but it will germinate, though more slowly, at temperatures as low as 36 deg. and as high as 90 deg.

The amount of soil moisture required is approximately the same for both wheat and smut germination. In very wet soils, with consequent shortage of oxygen, smut appears to be affected more than wheat.

After germination death of the fungus occurs in a few weeks if it is unable to come in contact with wheat in a susceptible stage. Wheat is susceptible to infection from the commencement of germination to the appearance of the first green leaf. This period is usually about eight to 10 days, but may vary with the depth of sowing, soil moisture, temperature, and the use of bunt treatments.

After infection the fungus develops in the wheat plant without obvious injury to it. If it reaches the growing points of the plant and maintains its position there, such growing points eventually produce smutted heads. If it fails to reach or maintain its position at the growing points the heads are

not smutted, and there is no visible evidence of infection. In an intermediate condition only certain of the heads, usually those on secondary growths, are affected.

Resistance is not understood, but that varieties do differ in their liability to attack is undoubted. The different races of wheat vary in this respect, the Durums or Macaroni wheats being less liable than the common wheats, though crossbred wheats between the common wheats and resistant races may be resistant. All wheats appear to be equally liable to attack. In the resistant varieties the fungus appears unable to flourish under normal conditions, some factor resisting its growth. This type of resistance is inherited, and new resistant crossbred varieties may be obtained if one or both the parents are resistant. Florence is an illustration of a variety so bred.

Some wheats may avoid severe infection (smut-escaping) under normal conditions if their period of susceptibility is shorter than normal. Unfavourable conditions causing slower germination would increase their liability.

The common occurrence of clean plants from badly smutted seed may be due to one or more of the following factors:—

1. The wheat may be naturally resistant.

2. Rapid germination may cause the danger period to pass before infection takes place. The temperature and soil moisture may be more favourable for the germination of wheat than smut spores. Soil temperatures over 75 deg. would tend to have this effect.

3. Conditions may be so favourable for the rapid growth of wheat that the fungus fails to reach the growing points.

From the foregoing notes it may with probability be concluded, assuming that the seed has not been treated for smut:—

1. That clean seed will produce clean crops.

2. That self-grown seed is likely to produce clean crops, as the seed will be clean in most cases. It is in the processes of harvesting and winnowing that the bunt balls are broken and the spores get on to the grains. Germination temperatures may be more suitable to wheat than smut (See 3). The cleanliness of self-sown crops is a matter of common observation.

3. That early sowing in soils containing sufficient moisture to germinate the wheat should be accompanied by low infection owing to the high temperatures favouring wheat rather than the smut.

4. That sowing in dry soils is likely to be followed by high infection, as both wheat and spores will probably germinate together following the advent of rain.

5. That sowing after the autumn rains have commenced is liable to produce high infection for the same reason as given in 4.

6. That sowing in badly drained soils or under other conditions unfavourable to wheat is liable to be followed by high infection owing to the slow germination and slow growth of the plants. Should the soil become very wet just after sowing it is possible that infection may be low, as such a condition may be more detrimental to the smut than to the wheat. In addition to the effects mentioned, unfavourable conditions for growth may actually affect the resistance even of resistant varieties. Mr. Limbourn has noted the increased liability under unfavourable conditions of the resistant variety Flor-

ence. In America, where there are two seasons for wheat sowing, it has been noticed that Florence and Marquis, when autumn sown, are less resistant than when spring sown—the best season for these varieties.

TREATMENT FOR SMUT PREVENTION.

While it is a fact that clean seed will produce clean crops, it is practically impossible to detect whether seed is free from bunt spores or not. Where the crop from which the seed was obtained was definitely known to be clean, it is safe to use such seed without treatment. Badly affected grain can be detected by both sight and smell, but when the infection is only moderate microscopic examination alone can say the seed is clean. As practically all infection takes place from spores on the seeds it is possible to prevent infection by killing these spores.

Three methods of seed treatment are in general use in Australia. Various proprietary preparations have been advertised, but these offer no special advantages over the usual methods and are not recommended. Of the three common methods in use the Department strongly advocates the dry treatment with copper carbonate in preference to either bluestone or formalin methods.

Bluestone Method.—As usually practised this consists of dipping the grain for 3-5 minutes in a solution of bluestone (copper sulphate), made by dissolving 1½ lbs. in 10 gallons of water. This dipping may or may not be followed by another in limewater or milk of lime.

The defects of this method, which is very effective against bunt, are as follows:—

The dipping does not kill the spores in the unbroken bunt balls. If these are not removed by skimming off the surface of the solution while the seed is stirred, they may cause re-infection if broken later.

The seed is wetted and must be dried as soon as possible and sown soon after treatment.

Bluestone causes a variable amount of damage to the seed, and delays and even prevents germination. This damage is only partially removed by dipping in lime water. The damage results from the solution penetrating the seed coat through cracks, usually minute, which almost invariably occur under our system of harvesting dead ripe grain.

Formalin Method.—This consists of dipping the seed for three to five minutes in a solution made by adding one pound of formalin to 40 gallons of water. It has the defects of bluestone in regard to wetting the seed and the removal of the bunt balls. Treated seed must be dried sufficiently and sown as soon as possible, as injury from formalin increases as the seed dries. The injuries are of two types. In the first place the seed coat is hardened, making it difficult for the seed to germinate and consequently delaying germination. In addition the absorption of the formalin gas which develops from the minute crystals of paraformaldehyde which form on the seed coats of the treated grain when dry causes a poisioning and more or less direct injury. The injury is reduced if sowing in moist soil occurs shortly after treatment. Delayed sowing or sowing in dry soils increases the injury. A further drawback to formalin is that it is less effective than bluestone in guarding against re-infection from bunt balls broken in the bags or the drill.

Copper Carbonate or Dry Treatment.—This consists of covering the grains with a fine impalpable powder containing copper carbonate. If the

powder is up to standard it will be found that two ounces is sufficient for each bushel of wheat.

The standard for copper carbonate dust as determined in California is as follows:—

It should contain 52-54 per cent. of copper carbonate and 39-42 per cent. of copper hydrate, totalling 93-94 per cent. of these two. It should have a density of not over 32lbs. per cubic foot, and be fine enough for 99 per cent. in aqueous solution to pass through a 200-mesh sieve. The colour should be light green, never blue. It is as effective as bluestone or formalin in controlling bunt, and has several advantages of those methods.

Treatment may be carried out at any time without any effect on the grain. The grain is not wetted and consequently runs through the drill more readily. Re-infection is impossible as the powder is not effective until the grain is sown and the soil is moist, that is, it acts upon the spores as the wheat commences to germinate. In consequence the presence of small amounts of bunt balls is immaterial. Germination is not affected. Indeed the grain is protected from various minor fungi in the soil which usually kill a percentage of the young plants.

The drawbacks to copper carbonate are several. Firstly, it is somewhat more expensive than bluestone or formalin; secondly, it is necessary to use some form of closed mixer to ensure the proper dusting of the seed. Such an apparatus can be readily constructed on the lines of a box churn. A number of machines for the purpose are on the market, which are quite effective. The third defect is that care must be taken not to inhale the dust when mixing or drilling as it is irritating and poisonous. The advantages are so great, however, that this system, which had its origin in New South Wales, is now rapidly replacing all others in Australia and in North America.

GENERAL NOTES ON BUNT TREATMENT.

It is the excellent practice of many farmers to sow special plots with high quality seed on specially prepared and selected soil for seed only. Such seed is carefully treated for bunt, and the resulting smut-free crop is then available for sowing in the main crop of the following season without treatment.

This is a justifiable saving, probably representing 90 per cent. of the cost of treating all seed sown.

SUMMARY.

Bunt results from attacks of two species of fungi.

Bunt causes loss to the farmer by—

(a) Reducing grain yield.

(b) Reducing the commercial value of the grain.

Infection takes place from spores on the seed.

Dry sowing is liable to increase bunt infection in crops from untreated seed.

Bunt may be controlled by seed treatment with bluestone or formalin solutions of copper carbonate dust.

The dry treatment of wheat with copper carbonate is the best method of protecting crops from bunt.

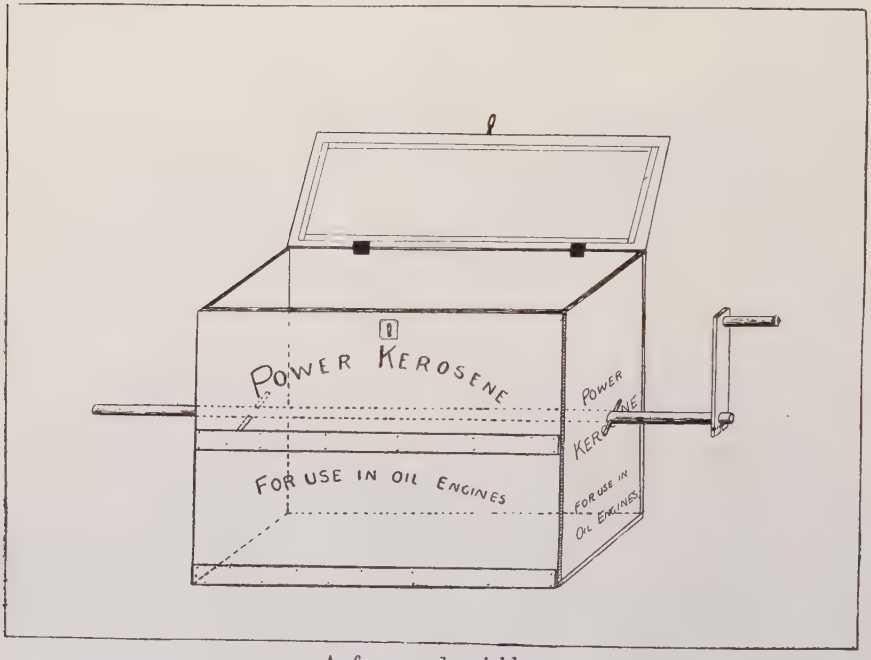
Clean crops will produce clean seed, which may be sown without treatment.

A SIMPLE DRY PICKLER.

Gerald L. Throssell, Dipl. Agric.

One of the reasons why many farmers have not adopted the dry pickling with copper carbonate powder, which has been proved to be so much superior to the bluestone and formalin solutions in the prevention of smut, seems to be the higher cost of many of the machines which are at present on the market. There are many settlers who say they cannot afford to make the outlay for a machine which is only used for two or three days in the year, and in consequence do not pickle their seed, which results in smutty crops.

For the past two seasons at the Merredin Experiment Farm pickling with bluestone and lime solutions has been abandoned in favour of the dry copper carbonate method. Each season over four hundred acres of wheat treated in this manner have been sown, and the results have been highly satisfactory—the crops being free from smut.



A farm-made pickler.

That there is no reason for a farmer to adhere to the obsolete wet methods —or not to pickle at all—simply because he cannot afford to purchase a dry pickling machine is shown by the accompanying sketch of a dry pickler which was contrived at the Experiment Farm, and which was used last year for treating the farm seed.

It simply consists of an ordinary kerosene case, rendered dust-proof by sealing the cracks with boards, fitted with a hinged airtight lid fastened with a catch. A piece of inch water-piping was used as a spindle, protruding six

inches from each end, as illustrated. The box was kept rigid on the spindle by means of a quarter-inch round pin at each end. A simple wooden handle fastened to one end completes the apparatus. The pickler was supported on two carpenter's trestles, but two forked posts would be sufficient.

The capacity of the box is about half a bushel, being approximately two-thirds full. Copper carbonate is used at the rate of two ounces to the bushel, and a measure was made which would hold enough carbonate for each pickling. By closing the lid and revolving the box for a minute and a half the wheat was thoroughly dusted with copper carbonate powder.

The quantity dealt with was obviously less than with the machines on the market, but it is believed to be quicker than the wet method unless special appliances are used. It is not suggested that this type and size of pickler is recommended, but it is merely given to show that this dry method of pickling is within the reach of all. It is thought that a box made to hold half a bag would be quite suitable for the average framer.

"BURT'S EARLY" OATS.

(Grown by J. K. Hebiton, Three Springs.)

The above crop was grown on new land (originally carrying York Gum and Prickly Scrub). Ploughed with the Sundercut and planted in April, the fine yield of 50 bushels per acre, over a 60-acre paddock, was obtained.

"Well and correctly branded."

BRANDING THE WOOL BALE.

Geo. L. Sutton, Director of Agriculture, and N. Davenport, Agricultural Cadet.

Many bales are well and neatly branded, but few are correctly branded. This fact will come as a surprise, if not as a shock, to the majority of wool growers, but an examination of the wool displayed on the show floor of any of our brokers will disclose what a very small percentage of the clips displayed are correctly branded. It is generally recognised that a bale should be branded in two places, and most bales are so branded, but rarely indeed are *both* the brands suitably placed and in such positions that the bale can be described as correctly branded.

Many growers take a pride in the "get-up" of their clip, and this extends to the branding of the bales. They want their bales to be "smart," for, quite apart from the commendable pride which they take in their clip and the way it is sent to market, they often appreciate the value which attaches to a properly and attractively branded bale, indicating to outsiders as it does some measure of the care taken with the preparation of its contents for sale. The majority of wool pressers who brand the bales are also anxious to turn out a "smart" bale, for they are desirous of showing by their good workmanship that they are masters of all the details of their craft. It is, therefore, apparent that the incorrect position of the brands on the bales is not due to carelessness or want of interest, but rather to a lack of understanding of what are the actual requirements of a well and correctly branded bale.

The brand consists of three parts, these are—

(a) The owner's mark or name of the holding, *e.g.*, MYARA.

(b) The abbreviated description of the contents, *e.g.*, PCS, and

(c) The number of the bale, *e.g.*, 4.

A well branded bale will have the whole of these details distinctly marked on two places, viz., on one side and on the top, with each detail in its relatively correct position on each portion.

The brand on this side, which then becomes the "front" of the bale, should be placed so that the name of the holding is about the centre of the bale, with the letters which form the abbreviated description of the contents just below the name. When in this position the details are still visible to the buyer when the top of the bale is opened (and the flap turned in) for inspection. The advantage of this will be seen from the illustration.

The top brand should be placed on the front flap with the name of holding or homestead and other details in similar relative positions to those which they occupy on the "front" of the bale.

It is quite unnecessary to have more than the name of the holding, homestead, or owner's mark of a simple style to indicate the ownership of the bale. If an owner's mark or symbol is used, it must not contain figures, as instances are not unknown where these have been confused with the bale numbers. Some owners, in addition to the name, also brand their bales with their registered sheep or cattle brand. This is wrong and also objectionable. The

correct method of using only the name of the station or homestead is very satisfactory, very general, and has so much to recommend it that it ought to become the universal practice.

Incidentally it may be stated that the word "Myara," which is used on the bales in the illustrations is derived from "MYAR," which means "a house" or "a homestead" in the Western Australian aboriginal dialect.

The name of the Holding should be placed about the centre of the bale.

Certain abbreviations are now used to correctly describe the contents of the bales. These are *recognised* in the wool trade, and are used in brokers' catalogues, they should be adhered to by the grower, and such as meet the individual requirements of the bale should be branded on it.

The recognised abbreviations are—MO, for Merino; XB, for Crossbred; CBK, for Comeback; COR, for Corriedale; LIN, for Lincoln; LSTR, for Leicester; BOR LSTR, for Border Leicester; ROM, for Romney; DORS, for Dorset Horn; SHROP, for Shropshire; DBLE, for Double; H, for Hoggets; W, for Wethers; E, for Ewes; R, for Rams; FLC, for Fleece; BLK, for Black; LBS, for Lambs; BKN, for Broken; NKS, for Necks; PCS, for Pieces; BLS, for Bellies; BKS, for Backs; STD, for Stained; LKS, for Locks; SCD, for Scoured.

At one time numerals 1, 2, and 3 were used to indicate first, second, and third classes of wool, but these led to confusion in handling and shipping the bales, the numeral indicating the class being often mistaken for the number of the bale, hence the letters A, B, C are used to indicate the description of each class of wool bales. For the best quality the letter A is used, other descriptions ranging downwards in the order given. Sometimes two or three of the same letters are used on the bale to indicate better quality and condition *as far only as that particular clip is concerned.* Thus AA would indicate superiority to A, and AAA to AA in the same clip. *But A in one clip may be quite equal to and even better than AAA in another clip.*

The letters in the abbreviated form of description are not used to indicate certain definite permanent standardised quality counts, viz., 56s., 60s., or 70s., but as previously stated, and now emphasised the letter or letters used (one or more) indicate the relative grade or class of the wool on which they are used, and relate *only* to that particular clip. The more careful and skilful the breeder in securing flock uniformity, and the better the classer, the fewer indicating letters will there be on the bale.

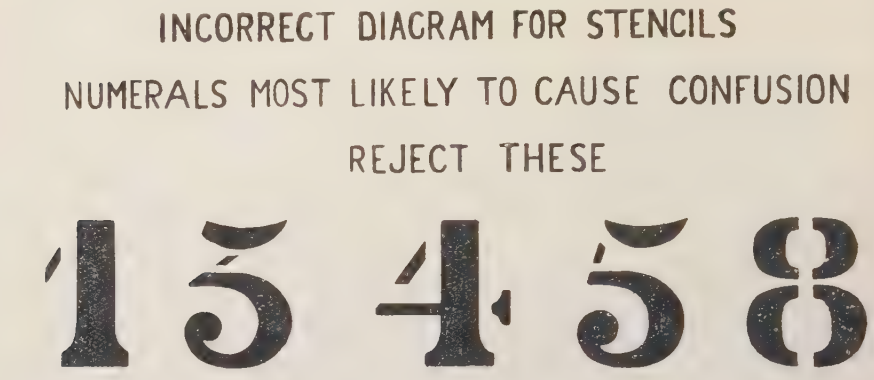
The use of more letters than are necessary to briefly describe the contents of a bale does not increase the value of the wool in the slightest degree, nor do numerous letters deceive or influence the buyer or broker regarding the value of the contents. On the other hand, the use of unnecessary letters is wasteful, for it increases the cost of every operation, commencing with the marking of the bale and including the printing of the catalogue and invoicing and despatching the proceeds. Every additional letter also adds considerably to the work of the buyer when dealing with his documents. It is largely because of this continued difficulty from shed to destination in connection with brands or marking that abbreviations are used. *It is, therefore, desirable to use as few letters as possible,* and so increase the efficiency of all concerned.

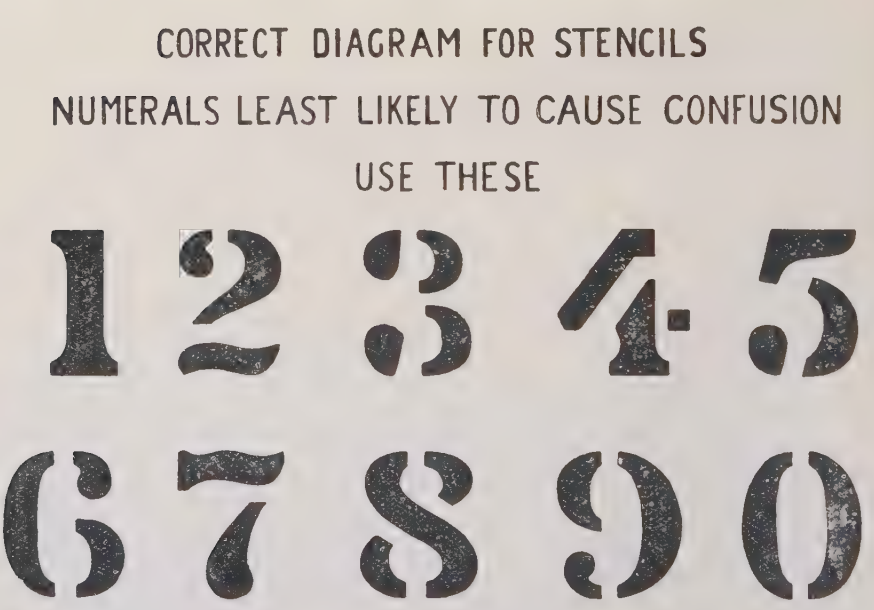
A bale branded MO will realise just as much as a bale branded AAAMO, provided the contents in each case are similar. It is the wool inside the bale, and not the letters on the outside, used to describe it, that determines the value. Evidence, if necessary, of this is furnished by an examination of brokers' catalogues where in "interlotted" lots bales branded AAMO will be found associated with and bringing the same price as those branded only MO.

The number should be placed slightly to the right hand side of the centre stripe and a few inches from the bottom. This is to prevent it being hidden by the iron band which encircles the bale when it is dumped, and, further, it is more distinct than when branded on the blue of the stripe.

Not all shapes of numerals are suitable for numbering bales. This is because during transport portion of the number becomes unavoidably chafed. When numerals of a certain shape are used considerable confusion arises if

portion becomes chafed. Such numerals when newly made may be quite distinct from all others, but when chafed or faded can easily be mistaken for some other. For example, the figure three of the type 3 is quite distinct when first made, but if the top bar becomes faded as the result of exposure or of being chafed it becomes 5, which is then as likely to be taken for a





mutilated five as for a three, or the same confusion is likely to occur if the upper vertical stroke becomes faded or chafed. If, however, the three is of the type 3 the risk of mistaking it for a five is considerably lessened even if part does become obliterated. The numerals most likely to cause confusion are shown herewith, as well as the set which experience has shown is likely to lead to least confusion.

Having discussed what constitutes a well-branded bale, it is now advisable to consider where this brand should be placed in order that the bale shall be correctly branded. As already stated each bale should be branded in two places, viz., on the "front" and on the front flap.

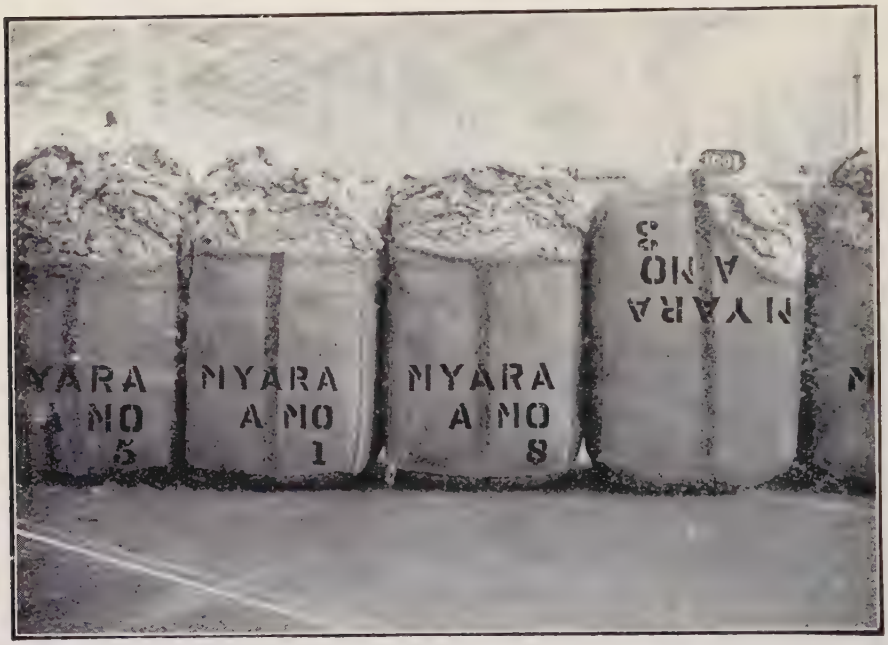
The brand and marking on the front of each bale is necessary so that it can be seen by the buyer or broker when inspecting the contents for valuation, for which purpose sample bales are placed side by side in rows on the broker's show floor, as in the illustration, in which "interlotted" bales of farmers' wool are shown. The first bale in this lot, though well branded, is not correctly branded, for the side which, of necessity, becomes the front, has no brand on it.

An "interlotted" lot displayed for sale.

The brand, description, and number on the top of each bale is also essential, so that it can be readily seen when the bales are stacked upon each other in the wool warehouse awaiting allotment for sale. Every grower's clip is stacked separately, bale upon bale, in what may be called streets or alleys with the branded tops placed towards and showing in the alleyway. Stacked in this way any required bale can be identified and removed from the bulk stacks to the show floor immediately when required.

There is also an additional reason for having the bales branded in two places. During transit from the farm or station, brands on bales frequently become chafed and faded, and at times obliterated. By having the brands correctly marked on the top and also on the side, one or other of them is usually preserved, thus maintaining the identification of the bale and preventing loss and confusion to all concerned.

The first step necessary to ensure that the bale shall be correctly branded is to arrive at a right decision as to what is the "front." This is the side on which the brand is placed. Most growers consider that any one of the four sides is suitable for this purpose, and this is the fundamental mistake which results in incorrect branding. Any of the sides would be suitable but for the regulations which govern the display for samples on the show floors. These require that if the "lot" consist of five bales three shall be shown, or all bales if the "lot" consists of three or fewer bales. They further require that the first of the bales shown shall be placed upside down, as in the "lot" illustrated, so that it can be opened at the bottom and the contents at that



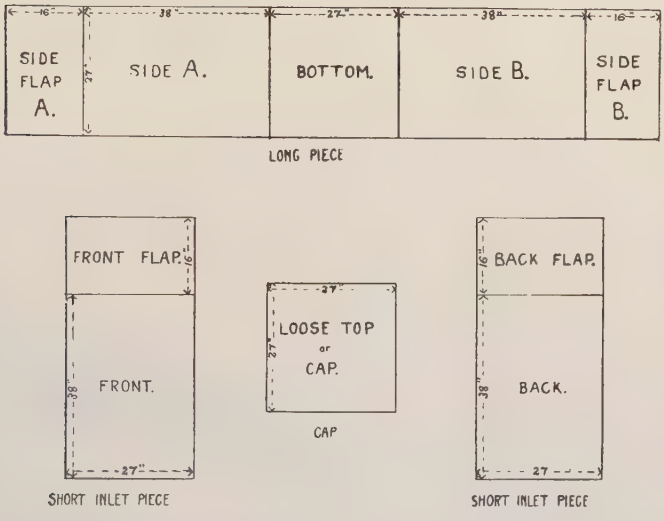
A lot displayed for buyers' inspection, as required by the regulations.

end examined by the buyer. In order to prevent permanent injury to the wool pack the "front" can be only one of either of two sides.

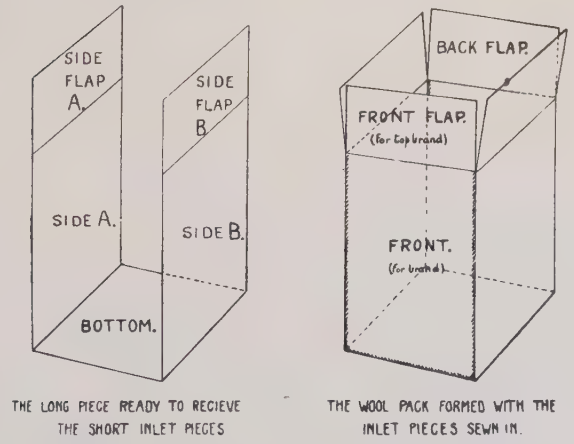
To understand why this is the case, and which of the sides can properly act as the front, it is necessary to call to mind the construction of the wool pack. If one be examined it will be seen, as is shown in the diagram herewith, to consist of four pieces, one "long" piece sufficiently long to form the bottom and two sides with their flaps, two others which form respectively the front and back and flaps, and the loose top or "cap." The pack is formed by placing the "long piece" around the two short pieces and sewing these to the bottom and up the two sides of each. These short pieces may be said to be "inlet" or "inset" into the long piece up to and as far as the lower edge of the flap. Seeing that this short "inlet" piece is sewn into the other side of the bale, it affords a means of cutting along the seam whereby the bale can be opened at the bottom without injury to the material of which

the pack is made, and afford the necessary facilities for inspection. When opened at the bottom on this side the cut-open seam can be resewn after the inspection of the wool is completed, and the bale is then as good as it was

THE PARTS AND CONSTRUCTION OF A WOOL PACK.



THE SEPARATE PARTS OF THE PACK.



THE CONSTRUCTION OF THE PACK.

before being cut open. It is obvious, therefore, that the front of the bale should be one of the two "inlet" pieces. In the diagram they are accordingly marked "front" and "back" respectively, and are interchangeable in this connection.

THE CORRECT ORDER FOR SECURING A WOOL PACK

The top brand should be placed on the flap, which is the continuation of the "front."

Very often when the brand is placed on the proper "front" of the bale, the top brand is improperly placed on one of the side flaps, and in consequence the top brand is at right angles to the front brand. This is obviously wrong, both brands should face in the same direction, and, therefore, the top brand should be placed on the front flap. In order to ensure that this is done it is necessary, after the "cap" is secured, to see that the flaps be fastened in the following order:—1st, side flaps; 2nd, back flaps; 3rd front flap. This procedure is illustrated in the diagram.

When it is the practice of the presser to fasten two of the flaps before the newly pressed bale leaves the press, the above order or procedure can be followed, with some presses, only when the wool pack is placed in the press with the "inlet" pieces to the side of the wool press and the long pieces facing the doorways. As there is no disadvantage in following this plan, it is sug-

The bottom of the bale must be left for the buyer's counter and port marks. Note the confusion when the bale is branded with grower's mark on the bottom.

gested that it be adopted at all times, and even when only the "cap" is secured before the bale is taken out of the press. However, whatever plan is followed care should be taken to secure the flaps in the order given, so as to have the front one secured last.

Just as there are two places on which the brand is placed on a well and properly branded bale, so there is one place in which it *must not* be put. This is on the bottom of the bale. This position is reserved for the buyer's

countermark and port mark of destination. The ill-effect of the grower's brand upon this countermark may be seen from the illustration.

To ensure that the brand shall be neat and distinct, clean and well cut stencils of block letters should be used. When ordering stencils owners should advise the maker that block letters are required, and that they must adhere strictly to the shape of numeral shown in the illustration, also to the abbreviations used for the descriptions, and, further, that the block letters and figures used should not be less than 3in. long.

The marking should be done only with *reliable black ink. Colours* must *not* be used, nor tar paint, tattoo oil, branding fluid, or any oil substance, as the grease from the wool makes the oily substance spread until it is unreadable. Tar is particularly objectionable.

In conclusion, it is pointed out that it is in the interest of the grower to not only have the bales well branded, but also correctly branded, for it is one of the outward signs of thoroughness on the part of the woolgrower, and tends to impart confidence to the buyer with regard to the careful packing of the contents, and may be the means of securing the last fraction of additional advance, which makes for records, and which is welcome remuneration for extra care exercised. Further, properly branded bales lessen the risk of loss which may result from confusion regarding the identity of bales improperly branded. Happily, owing to the great care exercised by our wool brokers, mistakes of this kind are not common. The risk does, however, obtain, and is an unnecessary one, provided the requirements for branding a bale correctly and well are realised and understood.

Summarised, the requirements of a well and correctly branded bale are:—

1. It shall have legibly marked on it—
   (a) The name of the holding, *e.g.*, MYARA.
   (b) The abbreviated description of the contents, *e.g.*, PCS.
   (c) The number of the bale, *e.g.*, 38.

2. Each bale shall be branded in two places, viz., on the "front," on the front flap.

3. The "front" shall be one of the two "inlet" pieces sewn into the pack.

4. To ensure that the brand be placed correctly on the top it is necessary that the front flap be secured last.

5. The bale must not be branded on the bottom.

6. The stencils must be "clean cut," and letters used of the block type and not less than 3in. long.

7. Only black ink should be used. Coloured ink or tar, paint, tattoo oil, or any oil substances are unsuitable.

POULTRY NOTES.

R. A. Dusting,
Poultry Adviser.

To show a margin of profit at the present high cost of poultry food, the weeding of all unprofitable birds must be drastically carried out. Any male birds not required for breeding purposes, or for which there will be sale as breeders, and all weaklings or undeveloped young stock, together with hens that have shown a tendency to persistent broodiness, should be the first to go. This will allow more space and accommodation with better care and feeding to the pullets now in lay and close up laying, more especially as regards green food which, at this season of the year, is always scarce.

Many poultry farmers fail to recognise the influence of green food on the development of the young stock, and the necessity for at least 50 per cent. of the daily ration for laying hens to be composed of fresh succulent green food. Recent experiments exhaustively carried out at the College of Agriculture, Berkeley, California, prove conclusively that lack of sufficient green food is the primary cause of disease amongst poultry, affecting not only growth and stamina, but also the internal organs, and weakening the whole system, making it more susceptible and less resistant to any diseases that poultry are liable to contract.

In this State, owing to the long dry summer and scarcity of natural grasses, a lucerne patch of quarter of an acre to every thousand fowls is as indispensable as a regular suppy of wheat, pollard, and bran, and no poultry farmer can make the business a success unless he makes provision for this most important factor. Besides its health-giving qualities it reduces the feed bill and lowers the cost of production of the egg and poultry meat.

By eliminating the birds that are not showing a profit more space is available for the grading of the young stock of different ages and sizes. In many of the yards of budding poultry farmers I visit in my rounds may be seen chicks six weeks old battling for feed amongst five months old birds; they get insufficient food, are trampled on by the older birds, harrassed from all the shady comfortable spots, and sleep on the floor amongst the droppings and filth, and the owners inquire why they will not grow and are always getting sick.

Each hatch should be kept separate, and at two months old every hatch should be re-graded and evenness of size in every pen aimed at. It is of no use to say that are provided with ample food, the more robust birds harry the slower maturing chicks, who get nervous, stay on the outskirts and daily lose courage to fight for a sufficiency of food; they become weeds and weaklings and without sufficient stamina to produce the margin of eggs necessary to show a profit over cost of food. These weaklings represent a loss of the profit anticipated at hatching time, and such a loss can be considerably reduced if re-grading is carried out thoroughly, and instead of having 30 per cent. of backward pullets in March and April, when eggs are scarce and prices high, the percentage can be reduced to five per cent. by sorting out the smaller birds, pushing them along, and encouraging them to lay as soon as possible by giving them a variety of foods, and providing them with

scratching litter in which to exercise, get a healthy appetite, and strengthen their digestive organs. A keen lookout should be kept for poultry parasites—Tick, Red Mite, and Stickfast Flea—and action taken immediately they are observed, as they multiply so rapidly that once they get a foothold, the cost in time and money increases in proportion.

The natural ambition of poultry breeders to-day is to obtain the greatest number of eggs from their stock, and in the interests of those engaged in the industry, and the progress of the State this ambition should be encouraged; but to aim only at increase in number of eggs irrespective of quality, size, and cost of production, and the deterioration of the fowl, is a foolish policy. The practice with most poultrymen, when they wish to obtain more eggs, is to increase the animal food supplied to the fowls. Most meat meals obtainable in this State contain an excessive amount of dried blood in comparison to the quantity of lean meat. For poultry an excess of concentrated dried bood is an irritant poison, and over-stimulating, and results in ovarian troubles, infertile eggs, bad hatches, and weakly chickens.

The losses of chickens that die before they are six weeks old are enormous. Bad incubation, faulty brooders, and wrong methods of feeding contribute, to a certain extent, toward this heavy mortality, but the main cause is badly reared, over stimulated, underfed, and under exercised breeding stock. If more attention were paid to the stamina and vitality of the breeding stock, and the young stock reared under more natural conditions, and given a chance to develop to maturity before commencing to lay, the lack of fertility, weakly chicks, and small eggs would not be much in evidence. A close study of egg-production makes it apparent that there is much in the system of feeding fowls, under varied conditions, and in different climates, and it does not follow that because a certain balanced ration is giving good results in England, Victoria, or America it will do the same in Western Australia. My own experience has proved to me that green food is a greater factor in the development and retention of vigor in fowls in this State than is realised by most poultrymen, and, used judicially, skim milk or cocoanut oilcake are more safe and give equally good results as meatmeals or other stimulants, with no bad results to the internal organism of the fowl.

As a winter green food for poultry I find that capeweed (which grows abundantly on the loose sandy soils, more especially if the sand has been cultivated) gives spendid results in egg production, and poultry prefer it to lucerne. Berseem Clover, if sown in drills in March and watered until it is established, will yield up to eight cuttings per annum of succulent green food, containing little fibre and high percentage of nitrogenous matter so valuable in the production of eggs and health giving qualities. Berseem should be cut first when only a few inches high in order to induce a better stool, and subsequent stronger growth. Frequent top-dressings of poultry manure during the winter will greatly assist rapid growth. Green stuff should be finely chaffed, and fed as freshly as possible—on no account should it be allowed to ferment. With wheat at 7s. 6d. per bushel, pollard £9 10s., and bran £9 per ton, the cost of feed alone to rear pullets to laying age is approximately 8s. per bird, add to this cost of incubation brooding, losses, and labour, and each pullet will have cost 10s. at six months old. The cost of feed for the following 12 months will be at least 12s. The hen at 18 months old has cost £1. How much has she earned? Suppose the average price of eggs to be 1s. 9d. per dozen for the 12 months' laying, and the hen lays 120 eggs in

the same period, the value of the eggs produced would be 17s. 6d.—2s. 6d. less than total cost of hen's rearing. The only profit made would be the margin between 2s. 6d. and the price realised for her carcase. This shows the necessity for increased production individually, by single testing, and the ultimate raising of the flock average by breeding only from tested layers, reared under the most suitable conditions and fed well, yet economically, on a mixture of foodstuffs which contain sufficient nutrients in the right proportion for the purpose required, viz., egg production.

Better stock, scientific feeding, and labour-saving methods will play the largest part in increasing the production of the individual poultry breeder and the State, and until these items are given more serious consideration we will still hear that "poultry does not pay."

STICKFAST FLEA.

R. A. DUSTING,
Poultry Adviser.

This pest is still greatly in evidence, and according to reports received at this office is spreading to all districts where poultry is being raised. The metropolitan markets are showing a decrease in the number of infested birds marketed. This is mainly owing to producers using preventive methods against the flea and treating any that are infested before sending them to market.

There are several methods of control of the flea. The most successful is to cement the floors of roosting houses and to have temporary shade that can be removed and destroyed. Another method of combating the flea is to remove the roof from all houses early in the summer and allow the sun to have full play on all parts of roosting quarters. If hens are housed in winter they will continue to use the same roosts when the roof is removed.

Yet another way is to have movable houses and move them from eight to 10 feet once weekly, the full sunlight being allowed to strike the position recently occupied by the house.

For spraying purposes to kill the flea and larvæ in the soil, "Dumore" has proved effective owing to its penetrating and lasting qualities.

For the treatment of the birds' heads infested with flea any non-burning oil or grease is all that is necessary to kill the flea that is on the bird, but this will not prevent the birds from again being attacked by fresh fleas, which must be destroyed in the soil.

With any and all of the above methods, cleanliness of the houses and yards must be combined. Droppings should be destroyed by immersion in water with quicklime added for at least 24 hours, when the solution may be used as a liquid manure.

It is only by constant vigilance and the use of preventive methods on the part of poultry breeders that this pest can be controlled.

THE GARDEN.

Seasonal Notes.

H. D. LARWOOD.

APRIL.

Sow—

Cabbage: Succession, East Ham, Drumhead.

Cauliflower: Early Short Stemmed Eclipse, Metropole, Autumn Giant.

Parsnips: Hollow Crown and The Student.

Carrot: Early Horn, Ox Heart, James' Intermediate.

Beetroot: Egyptian Turnip Rooted, Eclipse, Crimson Globe, Long Red Erfurt.

Peas: William Hurst and American Wonder.

Boad Beans: Early Long Pod and Broad Windsor.

Lettuce: New York, Drumhead, Cos, Neapolitan.

Radish: Long Scarlet, White and Scarlet Turnip varieties.

Onions: White Queen, White Barletta, White Italian Tripoli, Brown Spanish, Brown Globe, Giant Rocca.

Leeks: London Flag.

Kohlrabi: Purple and Green Leafed.

Rhubarb: Topp's Winter and Giant Winter varieties.

Transplant—Cabbage, Cauliflower, Onions, Leeks, Kohlrabi, Rhubarb, Celery, Brussels Sprouts, Swede Turnip.

MAY.

Sow seeds of Cabbage, Carrots, Parsnips, Turnips, Lettuce, Beet, Peas, Broad Beans, Radish, Onion, and Tomatoes (Early Large Red variety).

Plant where free from frost—Potatoes: Delaware, Bismarck, Early Rose, and Carmen varieties.

JUNE.

Same as May.

Cultivation during Winter Months.— Keep the soil as open as possible by frequent hoeing and cultivation. Never allow your garden land to become heavy and cloggy. Keep the drains well open and clean, if land has to be drained at all. Keep the land free from weeds. Top dressings of fertilisers during the winter months will materially assist growth. If the land is high and dry water any backward plants with a solution of a large handful of sulphate of ammonia or nitrate of soda to four gallons of water, or the same may be applied dry, depositing the fertiliser sufficiently away from the roots so as to avoid contact with the leaves, a handful to 40 or 50 plants. This application can be made every two or three weeks with safety. Blood and bone manure applied at the rate of one cwt. per square chain will also materially assist growth.

CABBAGE.

H. D. Larwood,
Potato Inspector.

This important plant belongs to the Brassica family, and has been so well developed from its wild state that it is now a very popular food item.

Both cabbage and cauliflower need to be transplanted. To raise the plants, select a light friable soil, thoroughly work it up and make into beds about three feet wide and varying in length, according to the number of plants required. When preparing the seed bed, leave the soil with a fine tilth and slightly raise the sides and end of the bed; this will help the bed to retain the moisture when applied. Manure the seed bed with farmyard manure, or a slight sprinkling of blood and bone fertiliser, which should be well hoed in. Smooth the surface with the back of a rake. Sow the seed fairly thickly, and cover with about a quarter of an inch of fine soil. Water the seed bed well during the summer, using a watercan with a fine rose. The seed will germinate in the course of several days, the period varying with the season. The plants are usually ready for transplanting in from four to six weeks. An ounce of seed should give several thousand plants, the number varying according to the size of the seed. As a rule late varieties of cauliflower seed are much larger than the early varieties. Cabbage seed can be sown every month of the year while cauliflowers are essentially a winter plant, and the seed can be sown only from late in December to April.

Cabbage can be grown all the year round on well-drained swamp land. It is of a hardy nature, and is not materially damaged by frost. In fact the texture of Savoy cabbage is improved by frost, giving the heart a tenderness which cannot be obtained without it; this also applies to Pickling or Red Cabbage.

Swamp land, and loamy soil if irrigated during the summer, can be planted at any time of the year. Summer crops are ready for cutting in about 10 weeks, and 12 to 14 weeks in the winter time. Cabbage is successfully grown during the winter months in the sand when liberally treated with manures.

Varieties.—For planting all the year round, "Henderson's Succession" will be found to be one of the best. It is a semi-drumhead variety, and is one of the best varieties of cabbage yet introduced. Care should be taken to cultivate the best strain of seed. This variety was raised by Mr. Peter Henderson, of New York, United States of America, and to make certain of the strain it may be necessary to buy from him direct. Varieties which run "Succession" very close are "Early Drumhead" and "Large White Brunswick." These are both good, especially the latter, for summer planting. Other good varireties which thrive in various localities are "St. John's Day," "Early Surehead," "East Ham," a sugar-loaf variety which does well in sand, and "Winningstadt."

Selection of Soil.—Well-drained swamp land is to be recommended for the general culture of cabbage. For late summer cropping (January and February) swamp land which has been flooded during the winter months and the land planted as the water goes back, or dries up, will be found most suitable.

This land is generally free from pests such as aphis and moth, owing to the flooded nature of the land during the mid-winter months. Chocolate or loamy soils of the South-West can be planted during the winter or spring, if irrigated during the summer months. Plantings are made in the sand during May, June, and early in July.

When to Sow.—For spring crop, the seed will need to be planted during June, July, and August. For summer—September, October, November, December, and January. For autumn and winter—February, March, April, and May.

Manuring.—This is one of the most important points to be observed. Cabbage must not be checked in any way during the growing period. If checked, especially during summer months, cabbage aphis and moth will invariably attack the crop. An abundance of manure must be used. A liberal dressing of farmyard manure as a foundation is usually applied, while to ensure a prolific crop, artificial manure is necessary. A watering of sulphate of ammonia during the summer months is beneficial, using a large handful to four gallons of water, and during the winter a handful dry to about 40 plants. Do not throw the sulphate of ammonia on the leaves, as direct contact will burn the foliage. Cabbage must be forced, especially during the summer months, to withstand the ravages of insect pests and to obtain the desired tenderness of texture to obtain full market rates. Farmyard manure is best broadcasted. Artificial manure is usually placed in a small hole made by the hoe, a small handful to each hole and a double handful of farmyard manure. If the lands or beds are narrow, these holes can be quickly made, and use will so train the eye that no line will be needed. The rows of holes are made from 18 to 24 inches apart, and the same distance in the rows. The manure in the hole is worked up and the plant placed in the centre. Broadcasting is to be recommended, as the plant roots will always have the manure to feed upon; considering the high cost of manure, the hole system is economical and gives good results. If retarded growth is noticed, an application of sulphate of ammonia will revive the plants. If grown on a very large scale, cabbage may be planted while ploughing. The manure can then be put along every second or third furrow, and the plants planted on the top of the furrow. This is an ideal method for winter and spring planting, as the land is left in an untrodden state and well loosened up. The land must be in good order, because after planting it is impossible to harrow the soil. To be successful, the land must be ploughed two or three times and harrowed thoroughly, previous to the last ploughing or planting. This method can also be applied to cauliflower planting during autumn.

Cultivation of Soil.—The land requires to be thoroughly prepared either by ploughing or digging. If the area of the land or beds is large, plant wide enough to use a horse cultivator, and be sure to hoe between the plants where the cultivator cannot reach, in order to loosen the soil. Weeds must be kept down. Do not let weeds seed, or the result will be a verification of the old saying, "One year's seeding, seven years' weeding."

Irrigation.—Sufficient moisture must be available either in the soil naturally or applied. The land must not be over-watered during the summer, otherwise there will be stoppage of growth, caused by the water-logged conditions. The great danger of applying water to plants is "overdoing it." Overhead

sprinkling lends itself very favourably to the cultivation of cauliflower and cabbage during the summer months. The sprinkling minimises the danger of aphis and insect pests. It is surprising the amount of moisture plants will absorb during the summer. Watering, especially by use of ditches, is often overdone.

Marketing.—Cabbage requires to be solid before marketing. Do not cut before the heads are well matured and heavy. While cabbage is usually sold by the bag (chaff bags being used), the value is often tested by the weight of the contents. For the inland and North-West trade, cabbage must be solid. When gathering for market, cut several leaves below the heart, leaving it well protected by at least one or two leaves all round. When bagging, fold these protecting leaves over the heart, but do not sew the mouth of the bag up. Pack the cabbages well up to the top of the bag so that it is necessary to form a net-work of string over the top of it.

CAULIFLOWERS.

Seed Beds.—The seed beds for these are prepared and sown in the same manner as for cabbage.

The Soil.—The selection of the soil is an important factor. It is erroneous to think that where cabbage will grow, cauliflower will grow; this is not so. The peaty swamps of our coastal area, while ideal for cabbage, are not so favourable for cauliflower. While there are a few favoured spots on the borders of some of our metropolitan swamps, *i.e.*, which chiefly consist of a sandy loam, the majority of cauliflower supplies for the markets are grown on the heavier soils towards the hills. Cauliflowers thrive on a good loamy chocolate soil. They are also grown with advantage on sandy clay soils. Land which is comparatively free from frosts will be found to be the most suitable. The plant itself is very little checked by frost, but if the heart is exposed to frost it will lose its whiteness and turn a dirty yellow colour. If the land is subject to frost, plant only the self-protecting varieties, the hearts of which are well protected by the inner leaves.

Varieties.—For early planting: "Early Erfurt," "Early Snowball," "White Queen," "Early Eclipse," and "Early Short Stemmed Eclipse."

For main crop: "Short Stemmed Eclipse," "Veitche's Autumn Giant," "Short Stemmed Giant," and "Giant of Naples."

For late crop: "Metropole," "Large Asiatic," and "Walcherin."

Plant seed for early varieties during December and January. Varieties for main crop in February and March, and varieties for late crop in March and April. The careful selection of seed is necessary. Procure seed from reliable sources. Cheap seed is often poor seed. Early cauliflowers will take from 10 weeks after transplanting; main crop from 13 weeks, and late varieties from four to six months to mature.

Fertilising.—The manuring of cauliflowers is the same as for cabbage, but if anything, the cauliflower needs more, both farmyard and artificial. With cauliflowers, an occasional application of sulphate of ammonia, say a handful to about forty plants during the latter part of the growing period, will materially assist in the development of the plants. A beautiful green colour will be obtained in the leaves and the formation of much superior flower will be the result. Market gardeners usually apply their top dressing every two or three weeks during the later stages of the growing period.

Transplanting.—When lifting the plants for transplanting, keep the air from the young rootlets as much as possible. This can be done by using a small fork, and placing plants directly into a box or vessel and transfering immediately to the permanent bed.

Cultivation.—Cauliflowers need more growing room than cabbages: the usual distance apart for the early varieties being 30 inches and the main and late crops three feet each way both between and in the rows. Constant hoeing of the soil is beneficial. While the production of prime cauliflowers is perhaps the severest test for any gardener, their cultivation almost solely depends on three points—suitable soil, select seed, and abundance of available plant food.

Irrigation.—Irrigation of cauliflowers is precisely the same as for cabbage.

Marketing.—Do not become weary waiting for the heart or flower to form; it will be sure to come in due time, usually during the last week or two. Wait till the flower has properly developed and fully filled the cup, which nature has formed for it, before cutting; do not, however, let the flower begin to run to a point resembling a pin head before cutting. A flower of good size, the larger the better, with a fine close compact texture, is what is required for market, and satisfactory values for these are invariably maintained. Cut the plant several leaves below the flower or about the second leaf from the bottom. If too far from market to cart in, put in bags, placing the whole of the cauliflower after it has been cut crosswise in the bags, and on no account whatever trim off the leaves above the heart and pack like cabbages, because the hearts will become bruised and discoloured. Pack with as many leaves as possible adhering to the heart.

Brocoli.—This is a very useful type of the cauliflower family, and will do where the winter is severe and cauliflowers cannot be grown. Plant same as in the case of cauliflowers.

Useful Hints.—Good soil, abundance of plant food by way of manure, forcing with ammonia, carefully selected seed, and careful irrigation should recompense the producer with prime market products. Keep the plants growing profusely, and attacks from pests will be minimised.

CULTIVATION OF THE POTATO.

G. N. Lowe,
Senior Potato Inspector.

It is the greatest possible mistake to allow the soil to become "tired" or exhausted. Correct fertilising, together with intelligent rotation of crops, will prevent this, and at the same time do much toward keeping in check diseases to which the potato is subject, and which flourish to the maximum when potatoes are planted season after season in the same paddock.

So often is the statement made that for the first few seasons a certain piece of land returned profitable crops, and then the yield began to dwindle, and various diseases became more and more apparent. The explanation is not far to seek, inasmuch as the soil has been unfairly treated in the matter of continuous cropping with potatoes and no effort has been made to build it up, even to its original fertility.

The maxim "A change is as good as a rest" can very truly be applied to the treatment of soils, and it is hardly fair to blame a soil for want of productiveness because of lack of commonsense treatment in the matter of rotation.

Soil is a mixture of inorganic material, such as rocks and other mineral substances, which by the action of sun, light, air, and weather has become broken down into finer particles, together with decayed or decaying vegetable or animal matter, this portion being, of course, organic.

The inorganic part, which greatly predominates, supplies the mineral needs of the plant, whilst the organic supplies the nitrogen, a very necessary element to the plant's wellbeing.

It is readily seen then that if the original materials are lacking or have become depleted through constant cropping, in order to restore this exhausted soil to a proper fertile condition steps must be taken to ensure a sufficient quantity of organic material being returned to the soil.

A proper rotation of, say, oats, peas or subterranean clover and potatoes will have the effect of accomplishing much in this direction. Instances of splendid results can be quoted where growers have been prevailed upon to plough in portions of their older subterranean clover plots at planting time. A wealth of green stuff of a nitrogen fixing plant, such as subterranean clover, cannot fail to restore a worn out soil quickly, particularly when its nitrogen content has become depleted.

Green manures affect the soil in a variety of ways, some of them being:—

(1) The addition of humus.

(2) The increasing of nitrogen, where a leguminous crop is used.

(3) The making available of plant food which might otherwise be lost.

The kind of green manure to be used depends, of course, upon the effect desired. If humus alone is needed then the bulkiest green crop that can be ploughed in will be best, provided this operation is carried out when the plants are at their most succulent and juicy stage, as decomposition takes place then more easily and more quickly.

If, however, nitrogen is required, as is always the case with potatoes, then one of the legume family, such as peas, clovers, etc., must be used. The

function of nitrogen is to stimulate a luxuriant tender growth, with tubers richer in nitrogen, but at the same time more prone to disease. To this fact and to the lack of potash in the potato fertiliser, more generally used, may be ascribed the poor keeping qualities of tubers from some of our older potato-growing areas. A deficiency in regard to nitrogen is shown by a weak yellow growth.

The elements of plant food in the soil are transformed or manufactured in the leaves in combination with sunlight and air gasses, and from the edible tubers. So that these processes may be performed to their maximum, it follows that the factory, that is the plant itself, must be strong and healthy.

The demand by the plant for nitrogen is stated to be particularly apparent during the earlier portion of its growth.

Phosphoric acid hastens the maturing of the plant, and is also supposed to help in starch production. There is a great deal of doubt, however, whether in this State growers are not using far too great a weight of superphosphate (the source of phosphoric acid) per acre in order to give the crop sufficient nitrogen, the mixtures used being probably too low in that particular content.

With this object in view a series of experiments designed to test the theory are in hand, the first of which is now planted in Benger Swamp.

The draft of the trials is printed below, and shows the variations of nitrogen and phosphoric acid. Potash is a constant factor except in the plot planted with No. 2 Potato Manure.

POTATO FERTILISING EXPERIMENTS AT BENGER—SUMMER CROP, 1925.

Plot.	Lbs. plant food per acre.	Manuring per acre.	Manuring per plot 1/25 acre.
Plot I. Control	N. 100lbs. ... P_2O_5 300lbs. ... K_2O 100lbs. ...	500lbs. Sulphate of Ammonia 1,429lbs. Super. ... ... 204lbs. Sulphate of Potash ...	20lbs. Sulphate of Ammonia. 57lbs. Super. 8lbs. Sulphate of Potash.
Plot II. ...	N. 72lbs. ... P_2O 300lbs. ...	2,400lbs. Potato Manure ...	96lbs. Potato Manure.
Plot III. ...	N. 70lbs. ... P_2O_5 300lbs. ... K_2O 100lbs. ...	350lbs. Sulphate of Ammonia... 1,429lbs. Super. ... ... 204lbs. Sulphate of Potash ...	14lbs. Sulphate of Ammonia. 57lbs. Super. 8lbs. Sulphate of Potash.
Plot IV. ...	N. 40lbs. ... P_2O_5 300lbs. ... K_2O 100lbs. ...	200lbs. Sulphate of Ammonia... 1,429lbs. Super. ... ... 204lbs. Sulphate of Potash ...	8lbs. Sulphate of Ammonia. 57lbs. Super. 8lbs. Sulphate of Potash.
Plot V. ... Control	N. 100lbs. ... P_2O_5 300lbs. ... K_2O 100lbs. ...	500lbs. Sulphate of Ammonia... 1,429lbs. Super ... ... 204lbs. Sulphate of Potash ...	20lbs. Sulphate of Ammonia. 57lbs. Super. 8lbs. Sulphate of Potash.
Plot VI. ...	N. 100lbs. ... P_2O_5 200lbs. ... K_2O 100lbs. ...	500lbs. Sulphate of Ammonia ... 952lbs. Super. ... ... 204lbs. Sulphate of Potash ...	20lbs. Sulphate of Ammonia. 38lbs. Super. 8lbs. Sulphate of Potash.
Plot VII....	N. 100lbs. ... P_2O_5 100lbs. ... K_2O 100lbs. ...	500lbs. Sulphate of Ammonia ... 476lbs. Super. ... ... 204lbs. Sulphate of Potash ...	20lbs. Sulphate of Ammonia. 19lbs. Super. 8lbs. Sulphate of Potash.
Plot VIII.	N. 100lbs. ... P_2O_5 300lbs. ... K_2O 100lbs. ...	645lbs. Sodium Nitrate ... 1,429lbs. Super ... ... 204lbs. Sulphate of Potash ...	20lbs. Sodium Nitrate. 57lbs. Super. 8lbs. Sulphate of Potash.
Plot IX. ... Control	N. 100lbs. ... P_2O_5 300lbs. ... K_2O 100lbs. ...	500lbs. Sulphate of Ammonia ... 1,429lbs. Super ... ... 204lbs. Sulphate of Potash ...	20lbs. Sulphate of Ammonia. 57lbs. Super. 8lbs. Sulphate of Potash.

One row of 10 chains long = 1/25th acre.

NOTE.—It was hoped to include a plot with blood as to source of organic nitrogen, but as material was unobtainable the plot had to be excluded.

HORTICULTURAL NOTES.

Geo. W. Wickens,
Officer in Charge Fruit Industry.

SEASONABLE WORK FOR APRIL, MAY, AND JUNE.

APRIL.

I wrote the Horticultural Notes for the December issue of the *Journal* in November before a reliable estimate of the season's fruit crop could be made, and at that time the profusion of blossoms and healthy appearance of the trees gave rise to anticipations of a record crop. Climatic conditions, however, alternating from warm and mild to rigorous and wintry, particularly in late spring, prevented many kinds and varieties of fruits from setting the bumper crop which was expected. But though the crop is not heavy, it is a very long way from being a failure, and during the months of March, April, and May a goodly number of steamers will call at the Ports of Fremantle, Albany, and Bunbury for the purpose of loading fruit for England, and the growers of kinds suitable for export will, in the first two months named, have their time fully occupied in picking, grading, and packing, both for export and local markets. Sufficient space has been booked for 237,000 cases to be sent to England from 2nd March to 18th May, and the indications at present point to this quantity being exceeded. Apples will comprise the major portion of our shipments, but there will also be a fair quantity of pears and grapes.

Western Australian apples, from the time of the first shipments, about 20 years ago, have carried an excellent name for quality and appearance on the European markets, and I think, with the exception of last year, growers have generally lived up to this reputation. Last season, however, it must be admitted the fruit forwarded was not of the usual high standard of quality: in the first place the season was against it, dry weather commencing in October, and continuing until May, and in the second, the packers were not thorough enough in rejecting, for when a considerable proportion of the fruit on the packing bench is inferior, the tendency is to become slack in grading.

This year we have a splendid chance of wiping out any bad impression that may have been created last year, for our apples have never been of better quality, and if reasonable care is exercised in rejecting large sized and blemished fruits, there should be no complaints from buyers, and the apples in the red cases will do in London this year what they have so often done before—top all competitors' returns by shillings a case.

I have mentioned apples particularly in the above, but no matter whether the fruit exported comprises apples, pears, grapes, or any other fruit a high standard of excellence should be striven for, because it does not pay to incur expense for rail freight, boat freight, and shipping charges on poor grade fruit.

Apply fertilisers to the orchards during April, and where trees are bearing well, do not be afraid of overdoing it. A reasonable dressing on average orchard soil for trees in full bearing is six cwt. superphosphate, two cwt.

muriate of potash per acre, with one and a-half bushels of peas sown in April and ploughed under in Spring.

The land should be thoroughly prepared this month where new orchards are to be planted. Plough to a depth of 10in. or 12in., and remove all roots of native trees.

Baiting for fruit fly should be continued, and every care taken to destroy all infested fruits.

Spray orange and lemon trees towards the end of this month with Bordeaux or Burgundy mixture to control Brown Rot, using 4lbs. bluestone, 4lbs. freshly burned lime, 50 gallons water or 4lbs. bluestone, 6lbs. washing soda, 50 gallons of water. The ground under the trees should also receive a liberal spraying with Bordeaux or Burgundy. When the disease is scattered throughout the orchard it is not wise to confine the spray to infected trees only: in the case mentioned all trees should be treated alike. Observations to date tend to show that the trees which have been sprayed to a height of 4ft. to 5ft. from the ground are as free from Brown Rot as those which have been sprayed all over.

MAY.

Apple growers will finish harvesting their crops this month, and the export season, so far as the English market for apples is concerned, will be over before the 31st.

Pruning will claim the attention of growers of stone fruits, particularly in the early districts near Perth, where most varieties of apricots, plums, and peaches will have shed their foliage. Where varieties of peaches liable to shed their buds (Briggs, Hales, Downing, Alexander, etc.) are grown, it is advisable to delay pruning until the buds have burst in early Spring.

Spray deciduous orchards for the control of San Jose, as soon as the leaves have fallen, using commercial lime sulphur at a strength of one gallon in 10 gallons of water, or a reliable brand of spraying oil may be substituted for lime sulphur. To keep San Josè Scale in check it is necessary to spray twice while the trees are dormant: the first to be applied as early as possible after the leaves have fallen, and the second towards the end of winter. As August is often a very wet month care should be exercised in making the May spraying a very thorough one.

If apple treees are infested with both San Josè Scale and Woolly Aphis, the best winter spray to use is lime sulphur, one in 10 to which has been added two ounces of Black Leaf 40 for every 10 gallons of lime sulphur mixture.

If the weather remains fine continue baiting trees for fruit fly.

Where orange and lemon trees were not treated for Brown Rot last month, they should be sprayed during the early part of this month, using Bordeaux or Burgundy as advised in April notes. In tests made both by this Department and individual growers it has been shown that one spraying in April or early May is sometimes sufficient to control the disease for the remainder of the season, but should the season prove favourable for the fungus, the trees should receive a further spraying when signs of infection appear. Later sprayings have the effect of spotting the fruit, but it is better to remove spray spots from sound fruits at time of picking than to have the crop destroyed by disease. In recommending spraying I am not over-

looking the fact that there are some districts where the disease has not appeared, or at any rate, has not been noticeable, and in such places I would not suggest spraying merely as a preventive measure, but should it make its appearance spraying should be resorted to at once.

JUNE.

Pruning of all deciduous trees should be pushed on with during this month.

Planting may be undertaken wherever the soil is not too wet and sticky.

Young plants when received from the nursery should be heeled in carefully so as to prevent the roots from drying out. To do this effectively the bundles of ten, in which the nurserymen usually tie up the trees, should be opened and each tree placed separately in the soil. If this is done as soon as the trees arrive no harm will result if the planting has to be postponed for some weeks in the months of June or July.

The notes on planting for this month refer to deciduous trees only. Citrus trees give best results if planted at the latter end of August or early in September.

Any San Josè Scale infested orchards which have not received the first spraying mentioned in notes for May should be treated as early as possible this month.

Citrus growers should examine cracked oranges for signs of fruit fly, and destroy any found to be infested.

Orange export season commences this month, and as far as possible growers should gather the fruit when it is dry, and take every care in handling and packing to see that the fruit is not bruised nor the skins scratched with finger nails. Hundreds of cases of oranges which were sent forward for shipment last year were refused a permit on account of being in a wasty condition, and though wet weather at time of picking may have been responsible in some degree, rough handling was a contributory cause, and while the first was in a large measure unavoidable, the second was preventable.

NEW POTATO REGULATIONS.

The Minister for Agriculture (Hon. M. F. Troy) draws the attention of growers, potato merchants, vegetable salesmen, and others handling potatoes, to a regulation governing the distribution of potatoes within the State. This regulation which was put into force at the request of the potato growers, was gazetted on 7th November. It prohibits potatoes being conveyed either by road or rail, into an area extending from Rockingham to Mundijong, thence to the southernmost corner of Collie townsite, through Dinninup to Tingerup (on the Great Southern Railway) and to the sea-coast at Cape Riche, and following the coast back to the starting point. The Minister states that numerous breaches of this regulation have occurred, probably through ignorance, and he desires to warn those interested that prosecutions will be instituted if the regulation is further infringed.

BLASTOPHAGA FIG WASP.

(Blastophaga grossorum.)

L. J. NEWMAN, F.E.S.,
Entomologist.

CAPRIFICATION EXPERIMENT.

This beneficial wasp has been introduced and established for the purpose of fertilising the Smyrna figs which, without its agency, fail to mature their fruit. This has been successfully accomplished.

To test the further usefulness of this wasp when applied to the Mediterranean and Adriatic types commonly grown, an interesting experiment was made in 1920 with the White Adriatic and Adam figs, and again in December, 1924, with the Brown Turkey variety.

It may not be generally known that there are two distinct types of figs grown locally, namely, those which ripen an edible fruit without developing perfect or fertile seeds, or, in other words, those varieties which become pomologically but not botanically ripe. To this class belong all the edible varieties of figs grown in the State, with the exception of the Smyrna types. These varieties, owing to the absence of fertilisation and consequent lack of seed, can only be propagated by means of cuttings, suckers, or grafts. The second group contains those which are unable to ripen or become fit for eating except the formation of seeds takes place, when they become both pomologically and botanically ripe. To this class belongs the famous drying varieties, known as the Smyrna figs. These fruits produce fertile seeds which readily grow when planted. To accomplish this fertilisation caprification is essential. This is accomplished by the transference of the pollen from the wild Capri fig to the flowers of the Smyrna.

Unlike the flowers of most fruits those of the fig are developed within the fruit, and cannot be visited by ordinary passing insects, which generally act as pollen carriers, or it may be wind distributed.

In the case of the fig, nature has provided a highly specialised wasp for the cross-pollination of its flowers. This is a tiny chalcid wasp. The male is wingless, but the female is furnished with wings and is capable of flight. In general appearance the female is not unlike a small black-winged ant.

This tiny pollinising agent is developed within the Capri fig. This fig contains what are termed gall flowers and male flowers. It is a wild variety and useless for any other purpose than as a host medium for the propagation of this insect. The female making her way out of the Capri fruit has to push through a mass of male flowers which are situated at the top of the fig surrounding the orifice or opening. In passing through these flowers she becomes covered with the pollen grains.

When the wasp escapes from her host fruit she immediately flies away in search of a new Capri fig, in which to lay her eggs. The eggs are laid into the gall flowers found within this fruit. These eggs give rise to tiny legless maggots, which go through the whole of their larval and pupal stage within the gall flower, emerging in the manner previously described.

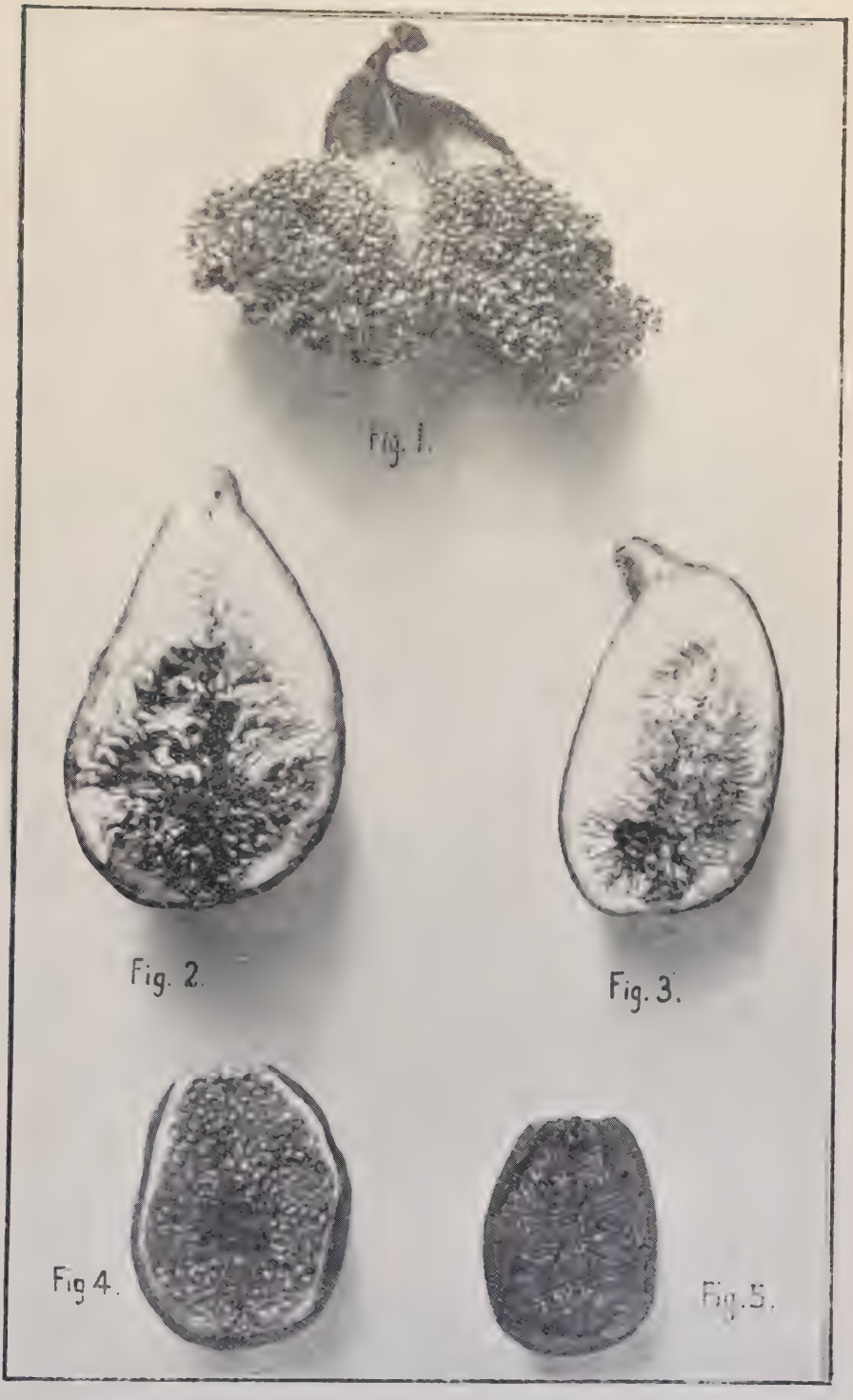


Fig. 1.—Capri fig opened showing the mass of gall flowers from which the wasps issued and the clusters of male pollen-bearing flowers.
Fig. 2.—Brown Turkey Fig caprified. Note development of seeds, flesh, and size.
Fig. 3.—Brown Turkey Fig uncaprified.
Fig. 4.—Brown Turkey Fig caprified. Observe seed formation.
Fig. 5.—Brown Turkey Fig uncaprified. Note absence of seeds.

If it happens that this wasp enters a Smyrna fruit fertilisation is accomplished, resulting from the shedding of the pollen grains carried on the legs and body of the wasp from the Capri to the Smyrna. It is only by this process that we can produce the popular Smyrna fruits. The trees will grow readily, but without the introduction of the wasp they are barren, the fruit falling off when about half grown.

Following the tests previously made in 1920, a further experiment was made during the present summer by applying this wasp to the Brown Turkey variety, which produces an edible fig, but is infertile. The results of the experiment were remarkable, the following effects being noted:—

1. The caprified fruits were observed within a fortnight to turn a dark green, and the skin to become very turgid compared with the non-caprified.

2. The flesh changed colour from a light brown to a decided reddish, rendering the fruit flesh unrecognisable as a Brown Turkey.

3. The fruits were densely packed with perfect seeds, giving a firm feeling when being cut.

4. The weight and size of the fruit was much increased.

5. The flavour was altered in that, plus the sugar, they had the popular "nutty" flavour due to the presence of true seeds.

6. The skin when ripe was of a distinctly bluish tinge instead of brown.

7. The caprification appeared to stimulate the fruits so that they grew out of the effects of the trouble known as the "Fig Leaf Mottle," which causes many of the fruits to shrivel and fall.

8. The caprified fruits were two to three weeks later in ripening.

In the 1920 experiments the findings were similar to those of the present.

Seed germination tests were then carried out, giving in each instance 100 per cent.

It has been demonstrated that the introduction of the wasp to any variety of figs which we grow is beneficial. It improves the size, quality and flavour, and is therefore worthy of trial on a larger scale.

WELL-VENTILATED HOUSES.

It is essential that the poultry house be made draught-proof, if it is not already so, but care should be taken to keep an abundance of pure air in circulation. The laying quarters should always be comfortable, if possible, but warmth at the expense of dryness is never wise. Restricted ventilation is almost certain to be accompanied by dampness, particularly if the house is a trifle overcrowded. Dampness in the hen-house is an invitation to colds and roup.—"Australian Farming."

FRUIT FLY BAIT.

Warning.

L. J. Newman, Entomologist.

It has come to the knowledge of the Department that some fruitgrowers have been substituting the dry or powdered form of arsenate of lead for the paste, and making the mistake of using the same weight of the dry, thus rendering the bait double strength. This is a serious error, as they have not only wasted material, but they have rendered the bait useless by the fact that it is too strong in poison content.

In common practice it is recognised that powdered arsenate of lead is twice as strong as the paste form. In the formula recommended by the Department, 5 ounces of paste arsenate of lead is used to every 4 gallons of the complete bait. It follows, therefore, that on the basis of the powdered form being twice as strong as the paste, 2½ ounces is sufficient to every 4 gallons. It is better to use under the formula strength than over.

In the experimental work undertaken when arriving at a suitable bait for the fruit fly, it was found that as low as 3 ounces of paste or 1½ ounces of dry arsenate of lead to 4 gallons of bait would kill the flies, but was much slower in its effects than when 5 ounces of paste or 2½ ounces of dry was used.

The fault in using the overdose of poison is not that the fruit fly will refuse to take it, but is due to the fact that she does not retain same. After partaking of the over-poisoned bait she quickly regurgitates it, or in other words it acts as an emetic. This was found to be consistently the case when more than 5 ounces of paste arsenate of lead was used in four gallons of bait.

The correct formula recommended by the Agricultural Department is as follows:—

For Foliage Baiting—

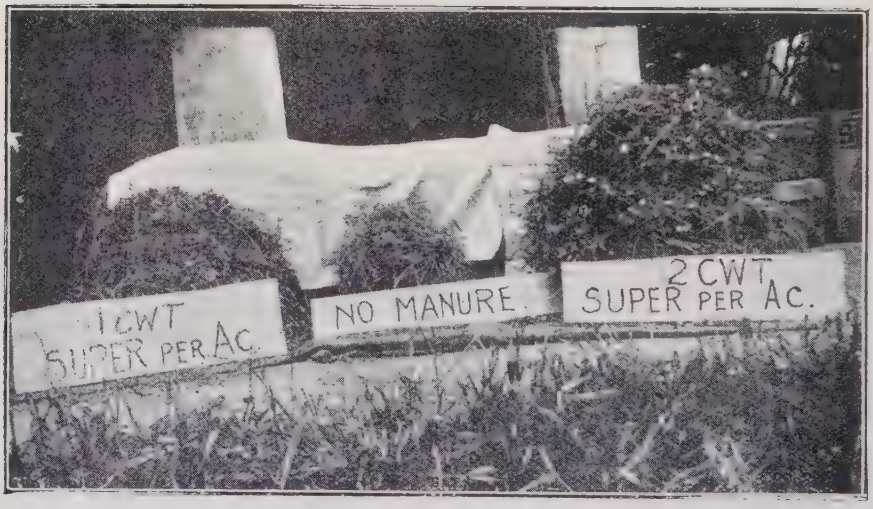
Paste arsenate of lead—5 ounces, or
Powdered arsenate of lead—2½ ounces.
Molasses—4 pounds.
Fruit syrup (orange juice preferred)—1 gallon.
Water to make up to four gallons.

For Traps only—

Pollard—4 pounds.
Molasses—4 ounces.
Paste arsenate of lead—5 ounces, or
Powdered arsenate of lead—2½ ounces.
Powdered borax—8 ounces.
Water to make up to four gallons.

For fuller particulars apply to Department for *Bulletin* No. 122, Fruit Fly, Description and Control.

Result of top-dressing demonstration, Mr. W. G. Argent's Farm, Dwarda, 1924.



Result of top-dressing demonstration, Mr. G. F. Parson's Farm, Narrogin, 1924.

PASTURES.

Top-dressing in Western Australia.

G. K. Baron-Hay, B.Sc., Agric.,
Agricultural Adviser, Dairy Branch.

The necessity of a phosphatic manure for successful crop production is now a recognised fact among West Australian farmers, but it was not until quite recently that the same necessity has been recognised for pasture.

In order to demonstrate the value of top-dressing pastures, experiments were inaugurated in 1922, the aim of which was two-fold—

1. To demonstrate definitely the value of top-dressing.
2. To endeavour to find the most economical manure to apply.

Since 1905 top-dressing has been practised by a few thoughtful farmers in this State, the first demonstrations on record being carried out by Mr. Chales Harper at Guildford, followed by Mr. R. A. Richardson at Serpentine. Excellent results were also obtained at Ferndale in 1908 by Messrs. Harper and Catton-Grasby, but these results, though advertised at the time, were not sufficient to make the practice general.

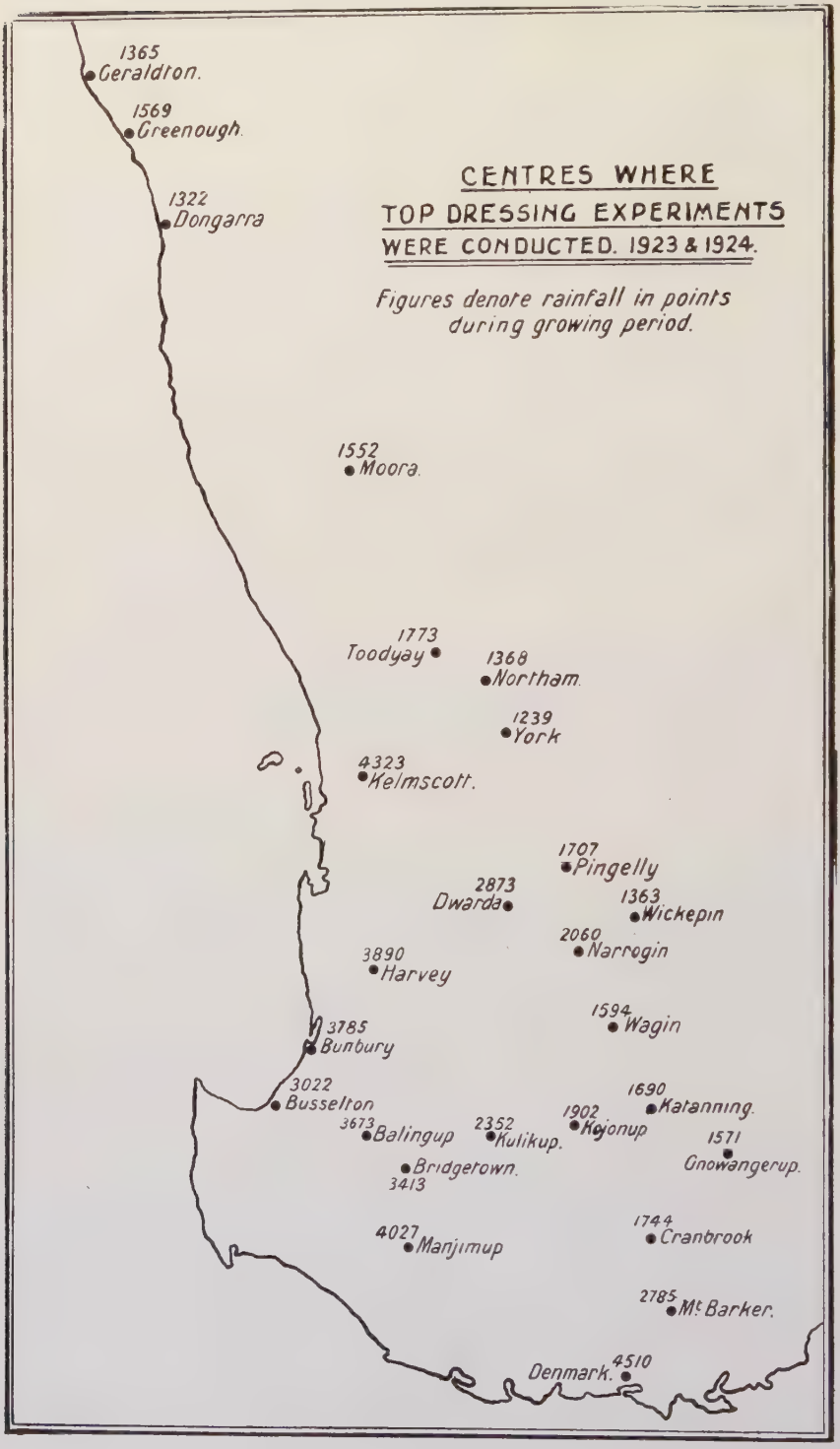
It was found necessary, in order to induce the practice to become State-wide, to carry out demonstrations in each district and on all types of soil. Superphosphate was chosen as the phosphatic manure to use in these demonstrations, for several reasons, the chief being—

1. Easily obtainable.
2. Supplies phosphoric acid more cheaply per unit than any other phosphatic manure.
3. The phosphate supplied is in a form readily soluble in water, and therefore easily available to plants.

At the request of Messrs. Cumming, Smith & Co., Limited, and the Mount Lyell Chemical Works, the Department of Agriculture undertook to co-operate in the carrying out of top-dressing demonstrations throughout the State, the above firms generously offering to supply the necessary superphosphate and signboards. Working through the Royal Agricultural Society, district agricultural societies were asked to recommend suitable sites for the demonstrations, and to supervise the plots during their growth. Such co-operation is of mutual benefit, providing data which is urgently needed, and which are available for any farmers who care to make use of them.

For each demonstration five acres of land were required, choosing, as far as possible, an average piece of land for the district. In some cases, however, distinctly poorer land than the average was selected at the request of local farmers who were desirous of finding out the effect of top-dressing on that particular type. The site, wherever possible, was chosen along a main road, and placed so that all the plots were plainly visible from the road. Suitable notices were erected, showing the treatment each plot had received.

An endeavour was made to sow all manures as soon after the first rains as possible, using a drill for sowing. In some cases, no drill being available,


1365
Geraldton.
1569
Greenough.
1322
Dongarra
CENTRES WHERE
TOP DRESSING EXPERIMENTS
WERE CONDUCTED. 1923 & 1924.
Figures denote rainfall in points
during growing period.
1552
Moora.
1773
Toodyay
1368
Northam.
1239
York
4323
Kelmscott.
1707
Pingelly
2873
Dwarda
1363
Wickepin
2060
Narrogin
3890
Harvey
1594
Wagin
3785
Bunbury
3022
Busselton
1690
Katanning.
1902
Kojonup
3673
Balingup
2352
Kulikup.
1571
Gnowangerup.
Bridgetown.
3413
1744
Cranbrook
4027
Manjimup
2785
Mt Barker.
Denmark.
4510

the manure was broadcast, and apparently results are as good when sown by hand as with the drill, though not so uniform.

Farmers, on whose land a demonstration was planned, were expected to keep all stock off the plots from the time of sowing the manure until the plots had been inspected by an officer of the Department and the herbage cut for comparative results.

The five-acre area chosen was divided into three plots:—

No. 1. Two acres, top-dressed with 1cwt. superphosphate per acre.

No. 2. One acre, no manure (the centre plot).

No. 3. Two acres, top-dressed with 2cwt. superphosphate per acre.

The accompanying map of the South-West agricultural area of the State shows districts where such demonstrations were carried out.

In order to obtain comparative results of the plots, the herbage was cut from an equal area on each plot and weighed. The gramineous and leguminous portions of the samples were then carefully separated and weighed individually, so as to gain figures throwing light on the *quality of herbage* on the top-dressed plots.

Thirteen demonstrations were carried out during the season 1922-23, and 25 during the season 1923-24. Some of the sites chosen in 1923 were retained for further demonstrations in 1924.

Unfortunately, in several cases, wandering stock gained access to the plots, causing damage sufficient to render the taking of fair samples impossible.

The following table gives the locations of the demonstration plots, the kind of soil, and the average rainfall for that district:—

Name of Farmer.	District.	Soil and Indigenous Timber.	Average Annual Rainfall.
			points.
J. C. Phillips ...	Toodyay ...	Black clay flat to red clay loam ...	2,126
H. Brockway ...	York	Heavy red clayey loam 6in. deep, coarse cement subsoil	1,767
W. O. Sewell ...	Pingelly ...	Brown loam ; Jam ; good ...	1,705
Austin Piesse ...	Wagin ...	Poor, typical, White Gum and She-oak country	1,745
Hon. Edwin Rose, M.L.C.	Bunbury ...	Alluvial flat ; flooded in winter ...	3,653
P. D. Ferguson...	Barberton ...	Heavy loam	1,861
W. G. Argent ...	Dwarda ...	Chocolate loam, Red Gum and Blue Gum	2,465
W. Gillett ...	Northam ...	Heavy grey clay (sets hard) ...	1,703
G. F. Parsons ...	Narrogin ...	Heavy clayey loam	1,976
H. V. Piesse ...	Katanning ...	Heavy clayey soil ; drainage unsatisfactory	1,839
Roy Hayward ...	Harvey ...	Brown loam ; Jarrah and Red Gum	3,975
F. Herbert ...	Dongarra ...	Deep dark grey loam ; good ...	1,918
A. Clinch ...	Greenough ...	Heavy clayey loam	1,961
Marwick Bros. ...	York	Heavy red loam ; York Gum ...	1,767

Name of Farmer.	District.	Soil and Indigenous Timber.	Average Annual Rainfall.
			points.
Late W. M. Baker	Katanning ...	Red clayey loam, rather gravelly ...	1,839
H. Joiner ...	Wickepin ...	Very poor, white gritty clay; White Gum	1,649
G. Perkins ...	Kojonup ...	Poor sandy loam; White Gum ...	2,231
Butter Factory	Gnowangerup...	Brown clayey soil; uncultivated...	1,826
Sounness Bros ...	Mt. Barker ...	Poor white sand; Jarrah and Red Gum	2,943
W. Middleton ...	Denmark ...	Sandy loam; Jarrah, few Red Gum	4,936
H. Trailmarsh ...	Kelmscott ...	Red loam to rich river flat	4,302
Johnson Bros. ...	Bunbury ...	Alluvial loam; Flooded Gum ...	3,653
E. Trigwell ...	Busselton ...	Calcareous sand, quickly dries ...	3,177
Captain Bell ...	Balingup ...	Poor gravelly light loam; Jarrah and Red Gum	3,936
Donald Palmer	Bridgetown ...	Red gravelly loam; Red Gum ...	3,398
F. Davis ...	Manjimup ...	Good chocolate loam; Red Gum and Blackbutt	4,364
C. J. Tuckey ...	Kulikup ...	Gravelly loam	2,572
G. E. Sewell ...	Geraldton ...	Heavy clay flat, wet in winter ...	1,875

From a perusal of the above list, it will be noticed that almost all types of soil have been treated, from poor sandy soils to rich alluvial flats, also that the annual rainfall varies from 16.49 inches to 49.36 inches.

The following table gives the results from those centres where it was found possible to obtain representative sample cuttings from each plot:—

Table I.—RESULTS OF TOP-DRESSING DEMONSTRATIONS, 1923.

Centre.	1cwt. Super. per acre.		No Manure.		2cwt. Super. per acre.		Date Plot Inspected.
	Weight of growth per acre.	Percentage yields.	Weight of growth per acre.	Percentage yields.	Weight of growth per acre.	Percentage yields.	
	tons.		tons.		tons.		
Narrogin ...	4·320	200	2·160	100	6·480	300	1–11–23
Pingelly	2·710	353	0·810	100	3·240	400	6–11–23
Toodyay ...	2·700	250	1·080	100	2·971	275	5–11–23
York	2·592	120	1·945	100	3·133	160	7–10–23
Bunbury ...	10·073	196	5·131	100	15·933	311	...
Moora	4·321	168	2·565	100	...	...	2–11–23
Northam ...	4·321	133	3·241	100	4·226	130	5–11–23
Katanning ...	2·160	200	1·080	100	2·700	250	13–11–23
Wagin	1·553	308	0·506	100	2·363	467	14–11–23
Harvey	4·433	136	3·241	100	9·655	298	21–11–23
Dwarda	5·942	200	2·971	100	3·241	109	...
Average, 1923	...	204	...	100	...	270	

2cwt. super, per acre. No manure. 1cwt. super. per acre.
Result of top-dressing demonstration, Messrs. Sounness Bros., Mt. Barker, 1924.

Result of top-dressing demonstration, Mr. W. Middleton's Farm, Denmark.

Table 2.—RESULTS OF TOP-DRESSING DEMONSTRATIONS, 1924.

Centre.	1cwt. Super. per acre.		No Manure.		2cwt. Super. per acre.		Date Plots Inspected.
	Weight of growth per acre.	Percentage yields.	Weight of growth per acre.	Percentage yields.	Weight of growth per acre.	Percentage yields.	
	tons.		tons.		tons.		
Bunbury ...	1·570	194	0·810	100	2·030	251	28–11–24
Kojonup ...	7·200	444	1·620	100	10·080	622	16–11–24
Mt. Barker ...	6·165	334	1·845	100	7·605	412	18–12–24
Bridgetown ...	2·160	448	0·540	100	3·240	600	2–12–24
Greenough ...	9·720	200	4·860	100	12·964	267	15–11–24
York	0·293	130	0·225	100	0·270	120	3–12–24
Kulikup	1·080	830	0·130	100	1·080	830	3–12–24
Wagin	1·300	138	0·940	100	2·800	295	10–11–24
Balingup ...	1·800	222	0·810	100	1·750	216	2–12–24
Manjimup ...	7·560	127	5·940	100	7·560	127	18–12–24
Busselton ...	1·215	225	0·540	100	1·215	225	12–12–24
Dwarda	12·240	183	6·660	100	12·420	186	13–11–24
Gnowangerup ...	3·330	176	1·890	100	4·900	260	9–11–24
Geraldton ...	5·942	183	3·241	100	7·562	233	20–11–24
Kelmscott ...	6·660	194	3·420	100	5·940	173	17–11–24 (app.)
Narrogin ...	8·910	381	2·340	100	11·610	496	12–11–24
Wickepin ...	1·665	161	1·035	100	1·530	148	12–11–24
Pingelly	10·440	273	3·825	100	14·220	371	13–11–24
Denmark ...	17·640	350	5·040	100	15·840	314	6–11–24
Harvey	3·060	121	2·520	100	3·060	121	13–1–25
Northam ...	0·360	111	0·315	100	0·450	142	2–12–24
Average ...	...	258	...	100	...	305	

For comparing the results of top-dressing with superphosphate between different districts, the columns under "Percentage yields" should be noted. The aim of the demonstration necessitated the use of widely different classes of soil, and it would be inaccurate, for this reason alone, to compare different centres by the actual weights of material cut from the plots.

An endeavour was made to inspect the plots when the herbage showed maximum growth, and was still green, although this was not possible in all cases. This in part, accounts for the low yield obtained in some districts, where the herbage was not cut till dry or semi-dry.

The figures in Tables 1 and 2, representing as they do the results from 11 demonstrations in 1923 and 21 in 1924, conducted on many types of soils, and under varying conditions may be taken as a reliable guide to the value of top-dressing pasture with superphosphate in West Australia.

The average percentage yields for all demonstrations conducted during the two seasons under review are as follows:—

One cwt. superphosphate per acre, 240; no manure, 100; two cwt. superphosphate per acre, 293.

From the results it will be seen that a growth approximating to 2½ times that on unmanured land may be obtained by the application of one cwt. of superphosphate per acre to pasture lands.

An application of two cwt. of superphosphate under average conditions does not seem to be justified, the increased returns in weight of fodder not being comparable with that obtained if double the area were to be top-dressed with one cwt. of superphosphate per acre.

INFLUENCE OF RAINFALL.

When the top-dressing demonstration plots were organised in 1922, it was considered doubtful if success would attend the application of a manure to pasture in districts with an annual rainfall of less than 20 inches. Such encouraging results were, however, obtained in districts with a much less rainfall than 20 inches, *e.g.*, at Pingelly, Wagin, and Northam, that it was resolved to extend the demonstration plots into drier areas. In an endeavour to gain some idea as to the minimum rainfall necessary for the profitable top-dressing of pasture, plots were conducted as far east as Wickepin and as far north as Geraldton.

TABLE 3.—SHOWING RAINFALL AND DATE OF APPLICATION OF MANURE.

No Manure Plots equal 100 in every case.

District.	Percentage Yields.		Date of Application.	Rainfall, 6 months, October 31.	Average annual Rainfall.
	1cwt. Super. per acre.	2cwt. Super. per acre.			
			1923.	points.	points.
Northam ...	133	130	May 4	1,785	1,703
Pingelly ...	333	400	April 27	1,644	1,705
Wagin	308	467	May 15	1,703	1,745
York	120	160	May 1	1,583	1,767
Moora	168	...	May 1	1,870	1,861
Katanning ...	200	250	April 30	2,005	1,839
Narrogin ...	200	300	May 15	2,135	1,976
Toodyay ...	250	275	May 3	2,178	2,126
Dwarda ...	200	109	June 25	2,835	2,465
Bunbury ...	196	311	May 15	3,785	3,653
Harvey ...	136	298	April 26	4,746	3,975
			1924.		
Wickepin ...	161	148	May 1	1,363	1,649
Northam ...	111	142	June 23	1,268	1,703
Pingelly ...	273	371	May 7	1,707	1,705
Wagin	138	295	May 12	1,594	1,745
York	130	120	May 1	1,297	1,767
Gnowangerup ...	176	260	May 1	abt.1,571	1,826
Geraldton ...	183	233	April 23	1,365	1,875
Greenough ...	200	267	May 22	1,569	1,961
Narrogin ...	381	496	May 9	2,060	1,976
Kojonup ...	444	622	May 1	1,902	2,231
Dwarda ...	183	186	April 25	2,873	2,465
Kulikup ...	830	830	May 15	2,362	2,572
Mt. Barker* ...	334	412	July 7	2,785	2,943
Busselton* ...	225	225	May 6	3,022	3,177
Bridgetown* ...	448	600	June 16	3,415	3,398
Bunbury* ...	194	251	April 14	3,152	3,653
Balingup* ...	222	216	May 5	3,673	3,936
Harvey* ...	121	121	April ...	3,890	3,975
Kelmscott* ...	194	173	May 3	4,323	4,302
Manjimup* ...	127	127	May 21	4,027	4,364
Denmark* ...	350	314	April 24	4,510	4,936

* Rainfall for six months ending 30th November.

It will be noted from Table 3 that maximum results from top-dressing do not follow any particular line of rainfall. In order to facilitate a comparison, districts have been arranged according to their rainfall, commencing with those of low annual precipitation. The average rainfall is given, as well as the rainfall for the growing period (six months ending 31st October), during which the demonstrations were carried out.

The results from the tests carried out during the last two years tend to show that the top-dressing of pasture with superphosphate will be profitable in districts receiving upward of 15 inches of rain per annum.

Under the column "Date of application," in Table 3, it will be noticed that the manure was in every case applied in the autumn, and in the majority of cases early in the season, with the first rains. In only one case in a district of low rainfall, *i.e.*, Northam, on 23rd June, 1924, was the manure applied late in the season. The results here were not as good as in other "low rainfall" centres, where the manure had been applied with the first rains.

In order to give ample time for the herbage to grow in districts where an early spring is the rule, *i.e.*, Great Southern districts, and eastwards and north of the Swan River, it is necessary to apply the manure with or before the first rains. There is ample evidence in favour of this rule, and, in absence of evidence relating to late applications, the early sowing of manure is a safe rule to follow.

In the South-West district, however, where the precipitation is heavier, and the growing season lasts into November, applications of manure were made at later dates than the above. At Bridgetown in 1924 and Dwarda in 1923, the manure was not applied until the second and third weeks in June, while at Mount Barker, in 1924, the application was made on 7th July.

The resultant growth of herbage on the manured plots at all the above places was good. In the South-Wset, however, the majority of plots were top-dressed with the first rains, with good results. These results point to the possibility of the date of application being within wide limits in wet districts, and even that early spring applications migh be profitable.

It is generally recognised that phosphatic manure specially stimulates the root system of plants. This being so, the evidence for a late application of manure to pastures is not strong enough to warrant losing the early growth of feed obtained by applying the manure with the first rains, which practice is the one recommended.

QUALITY OF TOP-DRESSED PASTURE.

Not the least important result of the demonstrations has been the effect of superphosphate on the quality of the herbage.

It is well known that a phosphatic fertiliser specially stimulates leguminous plants, and it was expected that these plants would be specially stimulated in the pasture, at the expense of the weeds and grasses. Arrangements therefore were made to carefully separate the leguminous plants picked out from the non-leguminous, and weigh, so as to get reliable data on this important aspect of the effect of top-dressing.

Subterranean Clover on Mr. W. G. Argent's Farm, Dwarda. Top-dressed with 1cwt. superphosphate per acre.

The plot on the right top-dressed with 1cwt. superphosphate per acre. Plot on left untreated. Pingelly, 1924.

Sheep on Subterranean Clover, top-dressed with 1cwt. superphosphate per acre. Messrs. Sounness Bros., Mt. Barker.

The following table shows the character of the herbage cut at different centres, the percentage of legumes being given in each case:—

TABLE 4.—PERCENTAGE OF LEGUMINOUS PLANTS.

District.	1cwt. per care.	No manure.	2cwt. per acre.
Narrogin, 1923	50	50	67
Narrogin, 1924	71	12	67
Pingelly, 1923	40	Negligible	67
Pingelly, 1924	75	11	87
Toodyay, 1923	30	12	45
York	45	20	75
Bunbury, 1923	90	90	92
Moora	25	16	Not estimated.
Kulikup	50	10	75
Bunbury, 1924	86	25	95
Mt. Barker	68	Negligible.	72
Bridgetown	45	10	75
Greenough	43	33	55
Manjimup	95	95	95
Dwarda	71	44	83
Gnowangerup	68	19	71
Geraldton	54	Negligible.	64
Kelmscott	69	13	64
Denmark	79	40	95
Average	61	26	71

This table clearly indicates the extent to which the average pasture is improved in quality by the application of a phosphatic manure. It must be borne in mind, however, that the increase in the percentage of legumes, through top-dressing, does not necessarily imply that the number of leguminous plants is greater, but rather that the individual plants have made better growth. Unless seeds or small-stunted plants are present on land to be top-dressed, manuring cannot possibly have any beneficial effect.

Coincident with these demonstrations, the Department carried out experiments designed to elucidate the second aim, stated at the beginning of this article, namely, to find the most economical manures to apply.

These experiments were carried out in duplicate, using a "no manure" plot as the basis of comparison. Mr. A. B. Adams, of the Dairy Branch, supervised the work of carrying out these experiments.

Experiment 1 was designed to test the relative merits of basic slag and superphosphate.

The following shows the arrangement of the plots in these experiments:—

Plot No. 1—No manure.

Plot No. 2—200lbs., 17 per cent. superphosphate per acre.

Plot No. 3—200lbs., 17 per cent. basic slag per acre.

Plot No. 4—No manure.

Plot No. 5—200lbs., 17 per cent. superphosphate per acre.

Plot No. 6—200lbs., 17 per cent. basic slag per acre.

Plot No. 7—No manure.

Experiments on these lines were carried out on the following farms:—

TABLE 5.—RESULTS WITH BASIC SLAG AND SUPERPHOSPHATE.

Name of Farmer and District.	No Manure.	Percentage Yield.	Superphosphate.	Percentage Yield.	Basic Slag.	Percentage Yield.
	tons.		tons.		tons.	
W. Waters, Balingup (1923)	0·404	100	1·406	348	1·005	249
Do. (1924)	0·252	100	0·801	316	0·534	200
W. Arnott, Jarnadup (1923)	1·620	100	5·940	366	5·400	333
Do. (1924)			Eaten by stock.			
Average	...	100	...	344	...	261

The plots at Balingup were top-dressed in 1923 but not in 1924. This was done so that the residual effect of superphosphate and basic slag could be compared. Although it is probable basic slag will show results over a longer period than superphosphate, these experiments point to the advantage being with superphosphate, over a two-year period. It is not possible, however, to be final on this point, as the experiments have only been carried out two years.

It is worthy of note that both in these experiments and the previous demonstrations described above, superphosphate has shown consistently good

results in South-West districts with a heavy rainfall. This will come as a surprise to some farmers, as it is quite common to hear the opinion that in a district of heavy rainfall, superphosphate, containing as it does water soluble phosphoric acid, will be washed out of the soil with the first heavy rains.

In practice, soon after superphosphate is added to an average soil, provided moisture is present, reversion takes place to the form of lime phosphate containing two parts of lime to one of phosphoric acid. This form, though insoluble in water, is soluble in weak acids, such as carbonic acid present in most soils, and can be utilised by plants quite readily.

Last season (1924) a portion of the plot which received 200lbs. superphosphate in 1923 at Balingup was top-dressed with 100lbs. of superphosphate with the following results:—

Table 6.

No Manure.		200lbs. Super., 1923		200lbs. Basic Slag, 1923.		200lbs. Super., 1923. 100lbs. Super., 1924.	
Tons.	Percentage Yields.	Tons.	Percentage Yields.	Tons.	Percentage Yields.	Tons.	Percentage Yields.
0·252	100	0·801	318	0·534	200	2·151	854

The point to notice in these results is that the plot which was manured again the following year was easily better than any plot manured only the year before.

Mr. A. B. Adams, who supervised this experiment, remarked:—"When inspected during the growing period, that part which received 100lbs. superphosphate in 1924 was much more forward in growth than the rest, and at no time was the residual value of the basic slag applied in 1923 greater than the residual value of superphosphate applied at the same time."

Experiments were also initiated last season to endeavour to find an economical manure which would show more marked residual effect on soils where superphosphate would be likely to revert to very insoluble forms rapidly, *i.e.*, on ferruginous soils. With this object in view, mixtures calculated to produce a basic phosphate were used, the plots being manured as in the following table:—

Plot No. 1—No manure.
Plot No. 2—Superphosphate, 300lbs. per acre.
Plot No. 3—Superphosphate, 200lbs. per acre, plus ground rock phosphate, 100lbs. per acre.
Plot No. 4—Superphosphate, 300lbs. per acre, plus ground limestone, 50lbs. per acre.
Plot No. 5—No manure.
Plot No. 6—Superphosphate, 300lbs. per acre.
Plot No. 7—Superphosphate, 200lbs. per acre, plus ground rock phosphate, 100lbs. per acre.
Plot No. 8—Superphosphate, 300lbs. per acre, plus ground limestone, 50lbs. per acre.
Plot No. 9—No manure.

The manures were mixed prior to being spread on the land, so as to revert the monocalcic phosphate in superphosphate to the dicalcic form, insoluble in water.

Experiments based on the above were carried out by Mr. A. B. Adams, Agricultural Adviser, at Bridgetown and Balbarrup, during last season, the first year's results being given below.

TABLE 7.—TOP-DRESSING WITH BASIC PHOSPHATES.

District.	No Manure.		300lbs. Super.		200lbs. Super., 100lbs. Ground Rock Phosphate.		300lbs. Super., 50lbs. Agricultural Lime.	
	Tons.	Percentage Yield.	Tons.	Percentage Yield.	Tons.	Percentage Yield.	Tons.	Percentage Yield.
L. Naylor, Bridgetown* ...	1·080	100	2·330	216	2·160	200	2·700†	250
F. Liddelow, Balbarrup ‡	6·480	100	10·800	167	10·800	167	11·340	175

* Weighed as hay. † 80lbs. Lake Clifton lime. ‡ Weighed green.

QUALITY OF LAND.

Bridgetown.—Red loam, indigenous timber, Blackbutt and Red Gum.

Balbarrup.—Chocolate loam, indigenous timber, Blackbutt, Jarrah, and Red Gum.

In these experiments it was also noticed that the leguminous plants were specially stimulated by application of the phosphatic manures, the figures for the Bridgetown plots being as follows:—

PERCENTAGE OF CLOVERS.

No Manure.	Super. 300lbs. per acre	Super. 200lbs. plus Ground Rock Phosphate 100lbs.	Super. 300lbs. plus 80lbs. Lime.
10	70	70	85

CONCLUSIONS.

In brief the inferences to be drawn from the foregoing experiments are as follows:—

1. Top-dressing with a phosphatic manure greatly increases the carrying capacity of pasture on the average about 2½ times.

2. Superphosphate gives as good results as any other phosphatic manure in all portions of the State. Owing to it being the cheapest manure per unit of phosphoric acid, it is to be preferred to other phosphatic manures.

3. One cwt. of superphosphate per acre is more economical than two cwt. per acre. It is preferable to top-dress 20 acres with one cwt. per acre than 10 acres with two cwt. per acre.

4. It is advisable to apply fertiliser early in autumn with the first rains. This period may be extended somewhat in wet districts with a long-growing period.

5. Maximum yield bears little relation to the rainfall, but top-dressing is a sound practice with districts having a "growing-period" rainfall of 16 inches or over.

6. An application of a phosphatic manure specially stimulates clovers and other legumes.

7. Weeds are gradually forced out of the pasture.

8. Results have been equally good on poor soils as on rich first-class lands, showing that all pasture lands need a phosphatic manure.

9. Where stock have been grazed on the plots, they have confined their attention to the manured portions, showing pasture more palatable.

CELLAR AND VINEYARD NOTES.

H. K. Johns, Viticulturist.

APRIL.

In the cellars let "cleanliness" be your motto. Remove such odds and ends that favour multiplication of the vinegar fly-fermentable refuse, skins, lees, and skimmings, etc. Drains should be cleaned daily. Dry lime should also be used on floors and drains.

MAY.

Cellar.—Attend to dry wines. When a lighted match will burn in the bung hole fermentation has completed, then rack and fill up. Sweet wines should also be racked and fortified to full strength.

Vineyard.—For new plantations, ploughing and sub-soiling should be done as early as possible. In feeding-off, sheep should not be allowed in vineyard until all leaves have changed colour. Plough early and deep. Manures should be applied. Peas, etc., for green manuring, should be sown to take advantage of early rains.

JUNE.

Cellar.—Keep all young dry wines well filled. First racking of young wines to be completed. Rack older wines. For this work choose fine weather, if possible.

Vineyard.—Pruning to be commenced. Ground for new vineyards to be marked out in readiness for planting. Manures to be applied.

SEED TREATMENT FOR OAT SMUT.

W. M. Carne,
Botanist and Plant Pathologist.

Recently a number of inquiries have been received in regard to the treatment of oats for the prevention of smut, and the following information should prove of interest:—

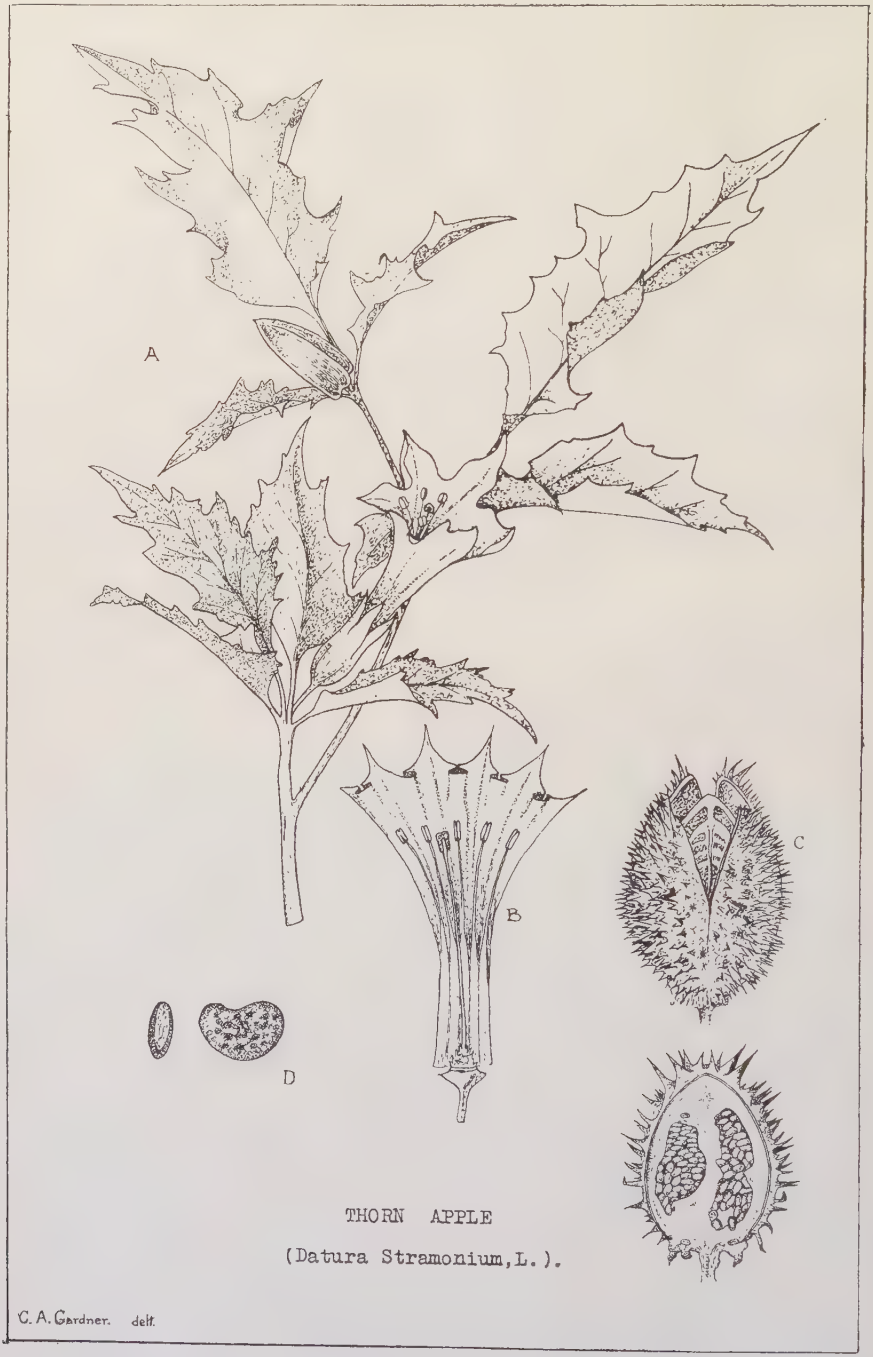
The use of formalin, or bluestone, is more reliable than the dry treatment with copper carbonate dust. The ordinary pickling method with liquid solutions requires the grain to be soaked for one and a-half to two hours for effective results, and this makes the seed difficult to dry sufficiently to run through the drill, while it is not advisable to sow the soaked seed in dry soil. The following method is effective, and has the advantage that the grain is more readily dried:—

Place the grain in a heap on a clean floor. Sprinkle with a formalin solution from a watering can as the grain is shovelled from one heap to another. Cover the heap with bags wetted in the same solution for six to eight hours, then spread the grain to dry. Sow as soon after treatment as possible. The solution is made by adding one pound of formalin to 30 gallons of water, and is used at the rate of about one gallon to one bushel. This treatment is also effective for covered smut of barley.

A RECORD AGED HOLSTEIN PRODUCER.

Apparently surfeited with the record yields of individual animals, American dairymen are seeking new standards of production for age. Pauline Brightview, No. 113,832, a pure-bred Holstein, owned by Dairy Hill Farms, of Ohio, has just completed what is believed to be a world's record for cows 15 years and over. Her yield for seven days, made at the advanced age of 15½ years, and after dropping her twelfth calf, was 21.47 lbs. fat (26.84 lbs. butter, 80 per cent. fat), from 551.7 lbs. milk. Last year she broke the world's record for a 14-year old cow by producing 24.04 lbs. fat (30.05 lbs. butter) in seven days, and 98.4 lbs. fat (123 lbs. butter) in 30 days. As a nine-year old she made a strictly official year record of 895.76 lbs. fat and 25,606 lbs. milk.

The record of Pauline Brightview as a mother is almost as imposing as her record as a producer. In twelve freshenings she has dropped five daughters and seven sons. Her oldest daughter and first calf is a 1,000 lb. cow, and has had six daughters and two sons. Her second daughter, a 28 lb. cow, has had three sons and two daughters, and her third daughter, a 900 lbs. cow, has had three daughters and two granddaughters.—"Australian Farming."



Explanation of Plate—

A.—Flowering branch.
B.—Flower in section.
C.—Ripe fruit, and fruit in section.
D.—Seeds (magnified).

THORN APPLE.

(Datura Stramonium, Linn.)

W. M. Carne, Botanist and Plant Pathologist, and
C. A. Gardner, Assistant.

Thorn Apple is an annual summer-growing weed found in waste places and in summer crops in the agricultural areas of this State where the soil is moist during the summer months. Originally a native of Asia, it has been introduced into most of the warm and temperate regions of the globe, and is now fairly common in all the Australian States.

Although commonly known as "Thorn Apple," this plant has a number of local names in different countries. In Australia, particularly in the Eastern States, apart from the above name it is known as "Castor Oil" and "Wild Castor Oil," thereby causing some confusion, as the true Castor Oil plant (*Ricinus communis*), so common in the waste spaces of the metropolitan area in this State, belongs to quite a different family. The Castor Oil plant is a shrub or small tree, while the Thorn Apple is much smaller, and not woody The only points held in common by the two species are a similarity in the shape and prickles of the fruit.

On account of its poisonous principle, Thorn Apple has been known from the earliest times. The name *Datura* is derived from a name probably of Sanskrit or Persian origin, applied to this plant, or a sister species. The specific name—*Stramonium*—is an abbreviation of the Greek for Mad Apple; the priests of Apollo were supposed to use the seeds of this plant to produce the paroxysms associated with the Delphic Oracle.

Thorn Apple is one of our noxious weeds, and is a poison plant. As such, the importation of the seeds is prohibited under the Agricultural Seeds Act. We have no record of its earliest appearance in this State, although it is improbable that it appeared here before 1865. Within the last few years it has attracted some attention from its appearance in Sudan Grass grown from seeds obtained from the Eastern States, although its occurrence in the metropolian area at least, dates much further back. Being of a succulent nature, and living in the summer months, it follows that Thorn Apple will be most prevalent where the soil is moist during summer, therefore its presence is likely to be most noticeable in the moister pastures and cultivations, and near creeks and swamps. Stock as a rule avoid the plant on account of the unpleasant odour and strong bitter taste of the leaves.

A Poison Plant.

Thorn Apple is a poisonous plant containing the alkaloids *daturine, hyoscyamine,* and *atropine;* all the parts are stated to be poisonous, particularly the seeds. Concerning the leaves there is rather conflicting evidence, but in the United States of America there are cases on record where cattle have been poisoned from eating the dried leaves mixed with hay. The toxicity of the plant is not destroyed by drying. The seeds are certainly poisonous, and have proved fatal to adults, children, and live stock in several instances. The symptoms of poisoning in stock include paralysis, dilated pupils of the eyes, and convulsions, and may terminate in death.

The seeds are used by some of the natives of India and South America in the preparation of an intoxicating drink, and to some extent medicinally. They are also used to poison enemies.

The leaves of Thorn Apple have been recognised for some time, both in Europe and Australia as a remedy for asthma. They are usually dried and mixed with tobacco for smoking, or they are smouldered with saltpetre, and the fumes inhaled. "Stramonium" cigarettes and cigars have been manufactured in Europe for upwards of sixty years.

Control.

In the eradication of Thorn Apple it is important that the plants should be pulled up or hoed out before they are allowed to seed, and it is desirable to burn the plants in order to lessen any risk of seeding or poisoning. There are cases known where serious injuries to the eyes have resulted from persons rubbing these organs with the hands while pulling up the plants, and, since permanent injury may result it is advisable to exercise care. Where the plants are numerous and individual eradication may prove costly, thorough cultivation of the young plants, succeeded by harrowing is an effective measure in suppressing the weed, but an outlook should be kept in order to see that none of the plants which may survive mature and seed. The facts that stock usually avoid it, and that it is a free producer of seeds, aid the plant in spreading rapidly in favourable localities, but it is improbable that this weed will ever become common in the dry areas.

When buying seeds of Sudan Grass farmers should examine the same, and refuse to accept any containing Thorn Apple seeds. These may be easily distinguished from the grass seeds, as they are larger, black and shining, somewhat kidney-shaped and rough.

Description of the Plant.

A rather succulent, disagreeably-scented plant of two to three feet in height, with forked branches bearing between them, or at their extremities solitary, shortly-stalked flowers. The leaves are rather large, dark green, and soft, irregularly toothed, and paler on the underside. The flowers are white, two to above three inches in length, tubular or trumpet-shaped, with five short, often yellowish, points. The fruit (a capsule) is roughly globular, beset with numerous stout conical prickles, about 1½ inches long, opening in four valves. Seeds black and shining, kidney-shaped, pitted with shallow hollows. The plant flowers during summer.

A purple-flowered Thorn Apple (*Datura Tatula*) is perhaps a variety of *D. stramonium*. It has not been recorded from Western Australia.

Some species of the *Datura* are cultivated, one fairly well-known in Western Australian gardens is the shrubby "Trumpet-flower," known to horticulturists as *Brugmansia*.

POISONING TREES AND BLACKBOYS WITH ARSENIC.

P. H. Harper, Gingin.

The following notes are based upon my experience with arsenic for killing growths preparatory to clearing.

Arsenic does not take the place of gelignite if one wishes to clear within 12 months. The explosion prevents suckering and kills instantaneously.

Arsenic is not very satisfactory for Zamia palms. If a crowbar is well worked round after being stabbed into the heart at the beginning of winter arsenic can be expected to be about 50 per cent. effective. Its action is very quick, but many of the plants may recover. A small quantity of kerosene poured into the heart is the most effective way of killing this plant.

I have found the use of arsenic to be effective on York gums (*Eucalyptus foecunda var. loxophleba*), Swamp or Flooded Gums (*E. rudis*), Paperbarks (*Melaleuca spp.*), and Blackboys (*Xanthorrhoea spp.*).

In killing trees they should be chopped down level with the ground, if small, leaving a hollow in the centre. The solution should be poured slowly on to the centre of the cut surface so as to allow the liquid to sink in. Trees too big to chop down should be frill-ringed close to the ground, cutting downward and deeply. The solution should be poured slowly into the cut. The higher the cut is made above the ground the more solution will be required. It will take twice as much axe-handle high as at ground level.

Fig. 1.—Blackboy showing position and angle of blow for flying the top.

With blackboys use a long and narrow-bladed axe, such as the axe end of a grub hoe with the hoe end cut off. Fly the tops of low blackboys by hitting at the bottom of the erect clump of green leaves (Fig. 1). Pour the solution into the cup so formed (Fig. 2). With tall plants make one, two, or three cuts according to diameter into the white as near the roots as pos-

sible, and pour the solution into the cuts. The amount of solution required varies with the height and thickness of the stems. One gallon will do from 60 to 180 of the shorter plants.

Fig. 2.—Blackboy showing method of applying solution and type of home-made axe found very suitable.

In all cases the best time to operate is when the sap is not moving. This is usually about February or March in dry soils or in winter in soils moist in summer.

To prepare the solution place 15 gallons of water in a 20-gallon vessel (such as a carbide drum). Add 20 pounds of caustic soda, then stir and add 56 pounds of white arsenic while stirring; dilute to 56 gallons for trees and 168 gallons for blackboys. Care must be taken not to inhale the soda dust, and in handling the arsenic, owing to the caustic nature of the former and to the latter being deadly poisonous.

LAYING NATURAL.

For Good Hen.

It is well to remember that the good hen continues laying because it is the most natural thing for her to do. If she is well fed and has good surroundings, the good hen will produce the eggs. But if she is neglected the good hen will not produce the eggs. If it is possible to so feed the hens that they cannot stop laying, then we have accomplished much in increasing returns, but if the feed is being carried out on what is often termed hard lines, that is giving the birds as much as they will eat, it is not wise to be keeping drones. Culling must, therefore, be practised vigorously. But when you have been over the flock and the birds appear to be laying well, avoid all sudden changes in feeding.—"Victorian Poultry Journal."

THE ZAMIA PALM AND ITS DESTRUCTION.

A. B. Adams, Dipl. Agric.,
Agricultural Adviser, Dairy Branch.

It has long been known that the cattle trouble known as "Palm Rickets" or "Wobbles" is caused by the Zamia Palm (*Macrozamia Fraseri*). Unfortunately but little definite experimental work has been undertaken to find the conditions under which cattle are mostly likely to contract the disease. It is highly probable that the effect depends more on the ratio of palm to other food eaten rather than on the actual amount of palm ingested. Certainly the most dangerous time for cattle is when running on burnt country, when the young palm leaves are almost the only food available, and compose approximately 100 per cent. of the diet, *i.e.*, when cattle are practically on a starvation diet.

The poisonous principle which causes the trouble has not been definitely proved, but the Government Analyst isolated acid potassium oxalate from the plant, and the writer found 0.4 per cent. of oxalic acid in the dry matter of the half-grown nut. It is also of interest to note that the symptoms are much like those of oxalic acid poisoning.

It is possible that if the cattle were receiving a good ration of clover-hay, or other fodder rich in lime salts, or were receiving bone meal or other lime phosphate regularly, they would not be so liable to contract the complaint, lime being the antidote for oxalic acid. Oxalic acid combines with lime to form oxalate of lime, which is very insoluble except in strong acids, the weak acid of the stomach not being able to dissolve it.

Although we are largely in the dark in definite knowledge of the poisonous principle and its action, we may be quite sure that if there are no zamias the cattle will not develop palm rickets, so it will be wise for the settler to endeavour to eliminate the palm from his holding, and the greater the number of palms per acre the more important is their destruction. It can hardly be too much impressed that the destruction of palms within the boundaries of a settler's holding is an entirely wise and profitable work, and an effort should be made to kill all that are growing on his land.

METHODS OF DESTRUCTION.

The method requiring the least outlay is to drive a sharpened steel bar well into the heart of the plant, give it a good turn to make the palms give in the centre, withdraw, and repeat in the next. This is most effective when done in the rainy season, as the water runs into the heart of the plant, and sets up a rot which kills it.

Although this is the least costly in outlay on materials, it is probably a good deal dearer than the methods following, as it is much harder work, and therefore costs more in labour.

The quickest and easiest method is to poison the plants with—

(a) voco kerosene;

(b) arsenite of soda (1lb. arsenic to 4 gallons).

Recent experiments on a small scale have satisfied the writer that of the various methods applied, the kerosene treatment is the most satisfactory. The arsenite of soda may be equally good if there is a long spell of dry weather immediately after the palms have been treated. Mr. Dunnet, of Nannup, reports that he killed over 300 acres of palms on coastal country near the Scott River, and that few, if any, grew again; he used a slight variation of the usual solution. After boiling arsenic and soda together in water, at the rate of one pound of white arsenic to two of washing soda in one gallon of water, it was diluted to make about four gallons of solution to the pound of arsenic. To make the solution and palms distasteful to stock, a kerosene-soap solution, similar to that used for spraying, was prepared, and one pint of this kerosene solution was added to every five gallons of arsenite of soda solution. Although used in such dilute quantity, Mr. Dunnet informs me that a smell of kerosene was noticeable at the base of the fronds of the dead plants 18 months afterwards. It is, of course, possible that this small amount of kerosene had some effect on the plant, as Mr. W. Harper reports that on his property palms treated with arsenite of soda died to all appearance, but afterwards made fresh growth. The writer has had the same experience when carrying out the following experiments:—

EXPERIMENTS IN PALM DESTRUCTION.

At Mr. Fromes, Picton, on 8th and 9th July, 1924, a quantity of palms were treated in the following manner:—

(1) Pulled out centre frond of palm and poured in one eggcupful of arsenite of soda.
(2) Poured one eggcupful of arsenite of soda into centre of plant.
(3) Poured two eggcupfuls of arsenite of soda into centre of plant.
(4) Centre frond of palm pulled and treated with half eggcup of power kerosene.
(5) Poured half eggcup power kerosene into centre of plant.
(6) Drove crowbar well into centre of plant.
(7) Crowbarred plant and treated with eggcup of power kerosene.
(8) Pulled centre frond of plant and treated with eggcup of power kerosene.
(9) Poured eggcup of power kerosene into centre of plant.

When visited on 23rd July it was found that the centre leaves of all those treated with arsenite of soda were dead or dying. All those receiving kerosene were feeling its effects, but to all appearance were not dying as quickly as those which had arsenite of soda. The crowbarred plants had suffered least of any.

On 23rd September the experimental area was again inspected and the results were found to be much the same as on the previous visit, but some of the plants appeared to be quite dead.

On 5th February, 1925, a further visit was paid, when the following results were noted. The results are numbered in the same order as the experiments above:—

(1) Of those treated, and of which 100 per cent. were apparently dead on a previous visit, 37 per cent. were making fresh growth from the centre.

(2) Of these, 75 per cent. were growing again.
(3) These, which were small plants and received double the quantity of poison, were all dead.
(4) Palms completely dead and fronds brown.
(5) Palms dead, green tips to some of the fronds.
(6) Sixteen per cent. growing again; balance dead.
(7) All plants dead.
(8) All plants dead.
(9) All plants dead.

These results would tend to prove that kerosene is, up to date, the most reliable method of destruction. As a check another lot of palms were treated at Mr. Maidment's, Picton, on 23rd September, 1924. In each case the fronds at the centre of the plant were pressed open with the left hand for convenience of pouring with the right, but no attempt was made to prepare the plant by barring or pulling out the centre frond. The trials were arranged as follows:—

(1) Large palms (those with about ten or a dozen fronds) received an eggcup of kerosene, small plants (with three to five fronds) received half an eggcupful.
(2) Large palms, as above, received an eggcup of arsenite of soda.

These plants were visited on 16th November, when it was found that all the plants were dead or dying, but those treated with arsenite of soda were dying much more rapidly than the rest.

On again visiting them on the 5th of February, all those treated with kerosene were almost, if not quite, dead, and those which had been dead the longest were showing no signs of regrowth. All those treated with arsenite of soda had died down completely, but had then started to make fresh growth, and many of them had a fresh bunch of fronds in the centre six inches high.

In the light of these facts, the use of arsenite of soda for palm destruction can no longer be recommended. It is, of course, quite probable that these results are partly due to the poison being diluted with rain which fell after the plants had been treated, or from the poison being too weak. As it cannot be said, in the South-West we are ever certain it will not rain, and if the poison is made much stronger, its great advantage, its cheapness, will be lost, it can be definitely recommended that the farmer should pin his faith to kerosene.

Mr. James Butcher, of Kelmscott, who reports that he has killed thousands of acres by the kerosene method, was good enough to communicate his experience to the writer, and says, *inter alia*, "Power kerosene used in the summer is best, but that it can be done at any time of the year except when raining. This is probably because when actually raining the kerosene floats on the water in the heart of the plant and runs away. If it once gets an opportunity to soak in, further rain is not likely to affect it much." He also states, "He killed about 1,000 palms with a case of kerosene. At that time it cost him about ninepence per acre, with kerosene at 7s. 6d. a case, as against 6s. for stabbing with the bar." As both labour and kerosene are dearer at the present time, the comparative costs will be in about the same proportion.

To get rid of palms in grazing paddocks and in bush country, the best method is to treat the plants with kerosene, and allow the dead plants to be burnt out with fires in the burning-off season.

It will also probably help to keep the stock from eating the palms if as much of the grass as possible is topdressed with superphosphate; it being extremely probable that the craving for palms, which was quite unknown in the early days of settlement, has some connection with the craving for bones and the unnatural appetite caused by a deficiency of phosphates in the feed.

Those without experience of palms are warned not to allow the fronds or other portions of grubbed palms to remain lying where stock can have access to them, as they are more dangerous than the growing plant.

Palm destruction is not usually suitable work to have done on contract, as such a long period elapses before the efficiency of the work can be judged.

In conclusion, it may be stated that in our present state of knowledge, the kerosene method of palm destruction is, for large areas, the cheapest and best. All that is necessary being to pour about an eggcup of kerosene into the centre of each palm, doing the work in dry weather, preferably in the summer.

The treated palms may be marked by bending down a frond on each plant as it is treated or by mixing a little white paint with the kerosene.

DAIRY COWS AND SALT.

It is more essential to provide the dairy cow with an adequate supply of salt than any other animal on the farm, writes the "Australian Farming" of January last. In the manufacture of milk she requires considerable salt, and unless it is provided in liberal quantities she will develop an abnormal appetite, dull eyes, a rough coat, and in the end there will be a complete breakdown. Dairy cows require varying quantities of salt. Those who are producing large flows require more than those producing small quantities. In a feed report of one of the leading dairy cows, it was stated that she consumed 50 lbs. of salt in a year, or more than two ounces per day. This seems like a generous quantity of salt, but it was none too much considering the work that she did in the year. A practice sometimes adopted is to mix with each 100 lbs. of feed from one-half to one lb. of salt, and at the same time arrange that the cows may also have free access to salt. With this method the animal is certain to obtain all the salt she requires.

THE DEVELOPMENT OF A DAIRY HERD.

(Conclusion.)

P. G. Hampshire,
Dairy Expert.

"TESTING" AND "CULLING."

In previous issues of the *Journal* articles have been written dealing with the "selection," "breeding," "feeding," and "management" of a dairy herd, and it is now proposed to deal with "testing" and "culling."

It may be mentioned that the whole fabric of the development of a profitable dairy herd, including the proper and satisfactory selection of stock, the breeding of dairy stock, the economical feeding of dairy stock and their management are all wrapped up in and are guided by testing. It is desired to stress to dairy farmers that the testing of their cows—in order that they may be in a position to determine their production—is a fundamental part of the work of the management of their dairy herd. It has been proved beyond any doubt that, without testing, the farmer is not in a position to say which are his best cows, which are his most profitable animals, whether he is feeding them economically, and whether the dairy sire being used is worth keeping.

Experiments have been conducted in different parts of Australia and other dairying countries of the world, where dairy farmers have been asked to select the cows of their herd in the order of merit as regards production as they would place them. The farmer was, in most instances, the man who bred the cows and who milked and handled them always, and yet when he placed those which, in his opinion from his observations, were the best producing animals, it was found that among the best cows he placed were some of the worst cows, and among cows he had not considered were found some of the best cows.

Experiments have been carried out where competent judges of dairy stock have been asked to place cows in their order of production, and it was found that the degree of accuracy of testing was eight times more sure than the placing by dairy stock judges.

The fat content of milk cannot be determined with any degree of accuracy by observing the cream which rises on it after standing. The cream does not rise readily on the milk of some cows, owing to the fat globules in the milk being very small. Again the colour of milk is not a sure guide in regard to its quality.

Instances which have come under the observation of the writer might be quoted to show the necessity for testing to determine the true worth of a cow. On one occasion when giving a testing demonstration in a dairying district, a farmer brought in samples of the milk of two of his best cows.

Cow No. 1 gave 40lbs. milk per day.
Cow No. 2 gave 35lbs. milk per day.

He was particularly interested in the test of these two cows, as during the previous week he had to determine which was the best cow in his herd

to take in to the local Show to compete for the prize offered for the cow giving the greatest quantity of butter fat. He selected Cow No. 1, because she gave four gallons of milk per day. When the two samples were tested it was found that Cow No. 1 produced milk which tested 2.6 per cent. fat, and Cow No. 2 produced milk which tested 6.4 per cent. fat. On computing the result on a weekly basis, it was found that Cow No. 1 produced 7.28lbs. fat for the week, and Cow No. 2 produced 15.68lbs. fat for the week, or more than twice as much butter fat than Cow No. 1. The irony of it was that the cow which won the prize at the Show produced 12.5lbs. fat for the week. Whilst he did not get a place in the competition with the cow he took to the Show, he had at home a cow which would have won easily. Needless to say, this farmer, after the demonstration, was a keen enthusiast in the advantages of testing.

Another case was noted where two cows, which, judged on their appearance, were fairly equal as regards dairy qualifications, and which calved about the same time and were fed exactly the same throughout their lactation period, produced under test as follows:—

Cow No. 1—8,500lbs. milk and 469lbs. fat during period of test, 300 days.

Cow No. 2—3,100lbs. milk and 169lbs. fat during period of test, 300 days.

A striking lesson from this result is that Cow No. 1 required approximately 35 per cent. of her feed as a maintenance ration and 65 per cent. was utilised for the production of milk and butter. Cow No. 2, on the other hand, required 56 per cent. of her feed as a maintenance ration, utilising only 44 per cent. of her feed for production.

[*An extract from the Journal of the Ministry of Agriculture, Great Britain, January, 1925, will be found very striking.*]

MILK RECORDING SCHEME OF THE MINISTRY.

The following is a striking example of the great difference which exists between herds in their milk-producing value:—

> Two members of the same milk-recording society had 42 cows each. All were recorded for the full year. The average yield of the 42 cows in one herd was 889 gallons; that of the other was 372 gallons. The approximate difference in the total yield was 21,700 gallons, which at one shilling per gallon represents a difference of £1,085 in the gross receipts for the same number of cows.

Cow-testing is the accountancy of dairy farming.—It is the only satisfactory means whereby the dairy farmer may obtain a true account of his results for the year—a true record of the production of each cow in the herd; and, when combined with the costs of feeding, labour, interest on capital, and incidentals, and debited against the production of each cow, he is enabled to ascertain which cows in the herd are the most profitable. A dairy herd may be likened to a departmental store, each cow being similar to the various branches. "Daisy" we will call the Drapery Department, "Beauty" the Millinery Department, "Blossom" the Boot Department, "Strawberry" the Ironmongery Department, and so on; all these branches have a manager. At intervals the general manager goes into the profit and loss of

each department. If the Boot Department ("Blossom") is not showing a profit, the general manager pointedly asks the branch manager the reason, and if he cannot remedy the matter, he is dispensed with, and another manager is put in his place. If "Blossom" at the end of the year, as a result of testing, is showing a loss and cannot put up a satisfactory reason, that is, on account of sickness or other circumstances, "Blossom" should be *culled* out. Each department or each cow should show a profit over cost of working.

A nice batch of heifers from "proved" cows to build up the herd.

Cow testing determines which are the best Heifer Calves to keep.—The necessity of having a production record of each of the cows in the herd is an obvious advantage in enabling the farmer to determine which of the heifer calves he will keep to replenish and build up his herd. Without a test record of the dams he may easily make the mistake of selling his best heifers and keeping his worst, as he cannot tell which are likely to be the most profitable heifers by appearance always. If, however, their dams are the best producers in his herd and their sire is from a high-producing cow, he can bank on these heifers being good producers.

Cow testing proves the economy of Feeding.—When a farmer is weighing the milk of his cows periodically and testing for butter fat, he is in a position to know whether it is economical to feed "Daisy," "Blossom," or "Beauty," as the case may be, with the various quantities of feed he is giving them. He probably will find that, if "Beauty" were given, say, 2lbs. more bran and a few pounds more lucerne hay per day, she will more than pay for the cost of that feed by her increased production. On the other hand, he may find, too, that "Daisy" is not showing a sufficient margin of profit over the cost of feed she is receiving. By reducing the quantity of feed to this cow she may show a profit. Another factor is that he is in a position to know the result of any change of feed in a proper and satisfactory manner. He finds perhaps that, on turning his herd from one paddock to another, there is a decided increase in yield. He also finds, as the result of

the weighing of milk and testing, that, if the cows are being underfed as the result of the pasture becoming shorter, it would pay to purchase concentrates or feed clover hay, lucerne hay, or oaten hay in addition to pastures.

Where a farmer is supplying butter fat to a butter factory, it is essential that he should determine all results on a butter fat basis. Even in the case where a farmer is selling the produce of his cows as whole milk, the advantages of weighing the milk are obvious as it is the only way in which a true record can be kept.

See that the cows keep you; do not keep the cows. Find the duffers and cull them out.

Cow testing proves the Dairy's Sire's worth.—Unless the dairy farmer is testing the daughters of the bull he is using, he is not in a position to determine whether this bull is worth keeping. He may be keeping a bull whose progeny are deteriorating his herd and reducing the average production. On the other hand, he may dispose of a bull whose daughters are a decided improvement on their mothers. How often does one come across a farmer who regrets that he sold such and such a bull to the butcher. Herd testing means the use of better bulls. Dairy farmers are enabled to find out the truth about the wasters and get rid of them; and, as the result of their knowledge of testing and its value, they look for a bull whose dam was an officially tested producer to take his place. Herd Testing Associations generally mean the formation of "Bull" Associations. Where farmers club together and have their cows tested as the result of the benefit they receive and the knowledge they have of their herds, they go further and find that they can profitably go in together and purchase high quality bulls, whose ancestors are proved high producers, for community use.

Testing makes Cow-keeping an interesting occupation.—The majority of dairy farmers who are testing find the working out of these results interesting and even fascinating. The dairy farmer has an intimate knowledge of the production of each animal in his herd. He watches the even production of one cow, how she hangs on to her production month after month, and, although she may not start as well as another cow when she freshens, she is catching up and even passes her towards the end of the lactation period. "Daisy" is a "stayer," whilst "Beauty," which started off splendidly is fading away. "Beauty" is a "sprinter" pure and simple, and, at the end of the lactation period has been outdistanced or "outstayed" by "Daisy" by even 100lbs. fat.

Dairy farmers who are testing find an interesting half hour in the evenings working out the results of their individual cows and estimating their probable production. It affords food for interesting conversation with their nearby neighbours. Cow testing lifts the drudgery of dairy farming out of the rut and hum-drum of every day life. Herd testing means greater interest in the avocation, better feeding, and improved breeding methods.

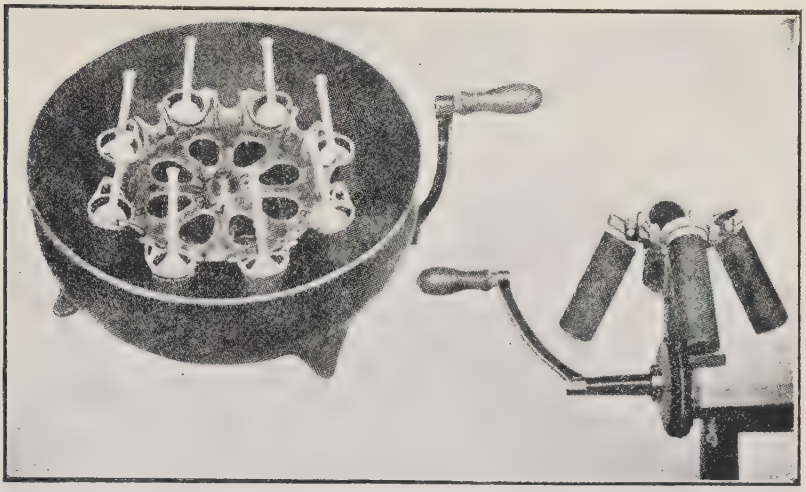
How testing may be carried out.—The testing of dairy herds may be conducted under one of the following methods:—

a. Privately or individually.

b. As a member of a Cow Testing Association (semi-official).

c. As a member of the Pure Breeds Herd Testing Scheme (official).

Where it is not possible to induce a sufficient number of nearby neighbours to form an association for the testing of their cows, farmers are well advised to carry out this work themselves. The outlay in connection with the equipment of a testing machine and apparatus for this purpose is not a big one. A four-bottle tester with all the necessary gear may be purchased for £2 10s. A 12-bottle machine would cost about £8 10s. A description of the method of carrying out testing is supplied with each testing machine outfit purchased. Testing is simple, and may be carried out in the dairy during the slack hours of midday away from the heat in the summer and the wet in the winter.



Types of Babcock Testers.

This Department would welcome teaching dairy farmers to test, and guarantees to turn them out reasonably proficient testers. Generally, managers of butter factories are willing to show farmers how to test.

A brief description of the method of conducting the testing of milk is as follows:—

1. Secure a representative sample of milk. In securing this, it is necessary to pour the whole of the cow's milk from one bucket to another three times, after weighing, and then take the sample in a two-ounce bottle.

2. Mark the bottle with the name of the cow, morning or evening.

3. After thoroughly stirring, measure out the required amount of milk with a 17.6 c.c. pipette, and deliver this into the test bottle.

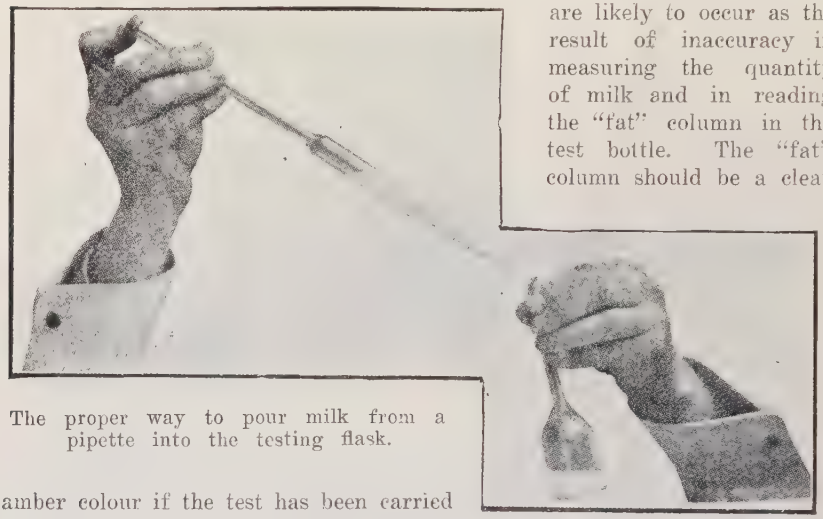
4. Where samples have been allowed to stand any length of time and the cream rises to the surface, it will be necessary to warm the milk up to about 100 degrees and thoroughly stir to mix the fat.

5. Add 17.5 c.c. of sulphuric acid to the milk in the test flask, and mix gently in a rotary motion. Place the flask in the testing machine and whirl at full speed for five minutes. Stop the machine and add hot water at a temperature of about 150 degrees F. to bring the fat up to the bottom of the neck of the flask. Whirl again at full speed for three minutes. Stop the

machine and add hot water to the flask to bring the fat in the neck of the flask up to about the eight per cent. or nine per cent. mark. Whirl for two minutes in the machine. Stop and read the test.

6. The test should be read at a temperature of about 140 degrees F. Record the test alongside the milk yield given by the cow.

7. Empty the milk test flask immediately and cleanse, shaking thoroughly to remove sediment in the bottle.



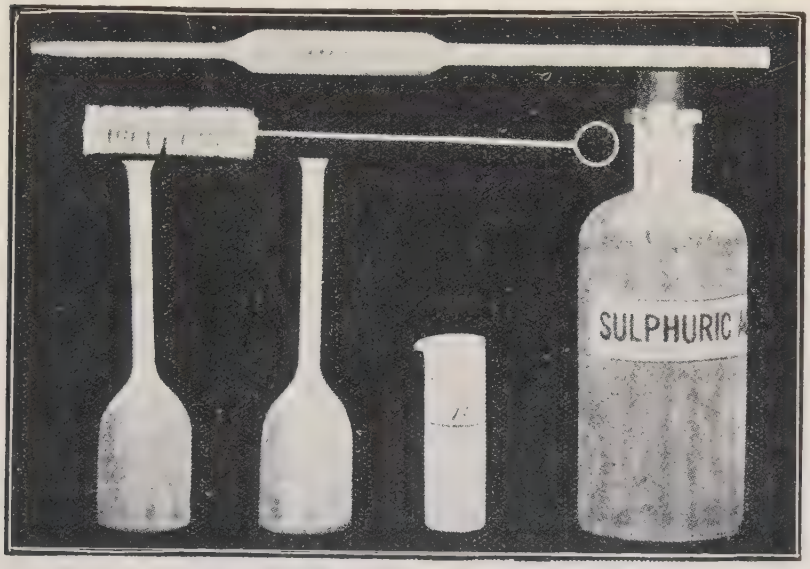
The proper way to pour milk from a pipette into the testing flask.

8. Errors in testing are likely to occur as the result of inaccuracy in measuring the quantity of milk and in reading the "fat" column in the test bottle. The "fat" column should be a clear amber colour if the test has been carried out properly. If too dark, it is usually the result of either too much acid or too strong acid being used. If, on the other hand, it is a pale whitish colour, it is accounted for by acid being weak or insufficient being used.

b. Where a sufficient number of farmers in one district can be got together, the formation of a Herd Testing Association (semi-official) will eliminate the work of testing individually. Such associations are formed by the association of 25 dairy farmers within a radius of from 15 to 20 miles, with the total number of cows not less than from 400 to 500. A competent young man is employed to carry out the testing once a month at each farm, he being accommodated by the farmer over night. The association either provides the tester with a horse and trap to allow of his travelling from farm to farm, or arrangements are made by each farmer to take the tester to the next place. When the tester arrives he weighs the milk of each cow, takes a sample from it both night and morning, testing the samples on the farm and leaving a copy of the result with the farmer. His visit is made at about the same date in each month. At the end of the year he is enabled to give the farmer the production record sheet showing the yield of each cow in the herd. The financing of such associations is usually carried out by a fee of £1 per herd membership, and a levy of from 3s. to 5s. per cow per annum.

c. Pure breeds herd testing is conducted by officers of the Department of Agriculture who visit each stud once a month, see the cows milked out, weigh the milk, and take samples from all the cows under test over a period of 24

hours. The total butter fat for the day is computed and multiplied by 30 days. Such testing is conducted by this Department with the object of providing the dairy farmers of the State with the knowledge of where they can procure registered pure bulls ex dams with an official production. In this and the next issue of the *Journal*, under the heading "Herd Improvement," will be published a list of the particulars of all registered pure cows which have been officially tested, and exceeded the standard of production recommended by this Department for the use of bulls for general herd improvement.



Apparatus required to carry out milk testing.

Increased Herd Averages follow continued Herd Testing.—Herd testing all over the world leads to increased herd averages and efficiency in dairy farming. Invariably, as the result of the introduction of herd testing, an increased average production per cow is seen each successive year of the herd under test.

The following figures will be of interest in relation to the foregoing, showing the increased average production of cows under test in Western Australia:—

The averages of all cows under test in Western Australia during the years 1921, 1922, 1923, *and* 1924, *with allowances for juniors, are as follow*:—

Period 273 *days.*

Year.	Butter Fat per cow lbs.
1921	312·20
1922	342·34
1923	344·45
1924	399·64

A glance at the Scottish Milk Records Association's result will be of interest:—

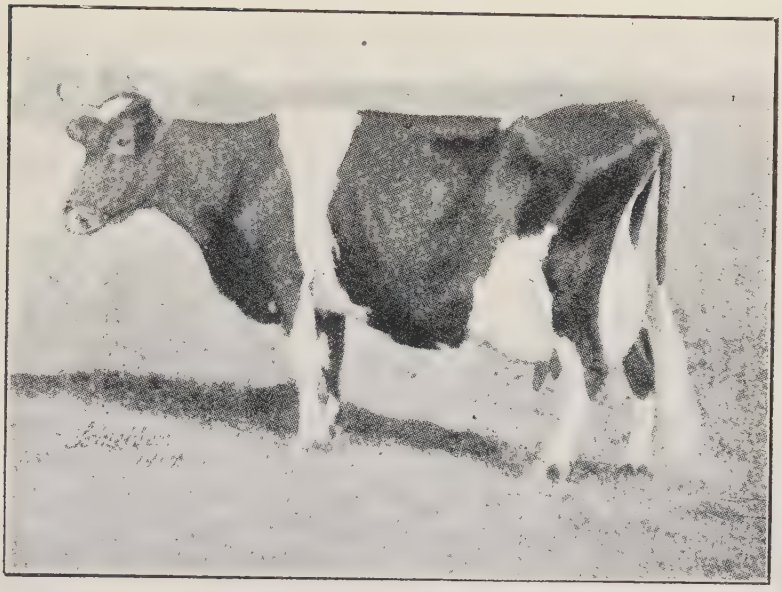
Year.	No. 1 Herd.		No. 2 Herd.		No. 3 Herd.	
	No. of Cows tested.	Percentage of Cows yielding more than 250lbs. fat.	No. of Cows tested.	Percentage of Cows yielding more than 250lbs. fat.	No. of Cows tested.	Percentage of Cows yielding more than 250lbs. fat.
1910	46	39	48	40	43	49
1911	42	64	52	56	39	54
1912	50	58	55	55	44	61
1913	52	77	56	79	38	89
1914	48	88	60	83	43	93
1915	53	80	53	82	39	97

As an instance of the value of herd testing in herd improvement and progress in dariy farming, a brief report on the Monticello, Wisconsin, Cow Testing Association is worth quoting:—

"The Monticello, Wisconsin, Cow Testing Association is composed of 26 members, 17 of whom are breeders of registered pure cows. There are 823 cows on test. Each herd is headed by a registered pure bull. This year 12 members tested for T.B., making a total of 22 herds tuberculin tested. Each member has from one to four silos, totalling 50 wood stave, four hollow tile, two brick, and one cement stave. There are 15 barns equipped with modern all steel fixtures, nine with part steel and part wood swinging stanchions, and two with the old style wood fixtures. There are 23 barns equipped with drinking cups, seven had ventilation systems installed this year, making a total of 11. Nine bull pens and yards were built this year, making a total of 12. Twenty farms are equipped with electric lights. Each member has a modern milk house and cooling tank. All members operate their own farms, 22 sell their milk to condenseries, and four sell their milk to Swiss and Limburger cheese factories. Ten members use motor trucks to haul their milk.

"The largest herd totals 164, including young stock, of which 62 are on test. The smallest herd totals 26 head, of which 19 are on test.
"Feed is bought co-operatively. Nineteen members are growing lucerne."

Herd Testing shows vast differences in Herd Averages.—In the September issue of this *Journal* was published the particulars of production, feed costs, and profits of herds under official test for the year ended 30th June, 1924. The best herd, which numbered 23 cows, showed 430.32lbs. fat as the average production of butter fat per cow for a nine months' lactation period. After making a deduction for the cost of feed per cow for the period (of which an accurate record was kept), there was a profit of £27 17s. 3d. per cow. The lowest producing herd under test yielded 198.34lbs. fat per cow,



The best cow. The "Star" Boarder.

The worst cow. A "non-paying" guest.

and, after making a deduction for cost of feeding, showed a profit of £11 13s. 3d. per cow. Between these two herds there was a difference of £16 4s. per cow. This means that a herd of 50 cows of the calibre of the leading herd would show a profit equal to £810 per annum greater than a herd of 50 cows similar to those of the worst herd.

Cow Testing at Busselton and Bunbury.—Some very interesting data has been obtained from the Herd Testing Competition which was conducted jointly by the Southern Districts Agricultural Society, Busselton, and the Department of Agriculture. The society gave prizes of £10, £5, and £1 for first, second, and third prizes respectively, for the best herd of 10 cows to be tested on farms surrounding the Busselton district over a 24-hour period. Nineteen farmers submitted their herds, and the results were taken for the best 10 cows of each herd. Altogether 327 cows were tested, and the records convey a very graphic illustration of the marked difference between one herd and another, the conditions as regards feeding being somewhat similar: the season being good and pastures plentiful.

Three hundred and twenty-seven cows tested, representing 19 herds. Best herd of 10 cows produced on a monthly basis 486lbs. of fat, and the worst herd of 10 cows 189lbs. of fat. The best cow produced 75lbs. of fat on a monthly basis as compared with 8lbs., as produced by the worst cow.

As will be noticed there is a marked difference between the best and worst herd and the best and worst cow.

The three lowest herds produced 699lbs. of fat for the month, and the three best 1,422lbs. of fat.

The data obtained in connection with the Herd Testing Competition conducted by officers of the Dairy Branch on behalf of the Wellington Agricultural Society, Bunbury, is also interesting. The competition was for the best herd of 10 cows, the herds being tested on their respective farms for a period of 24 hours. 11 herds were entered—12 cows each—best ten to count.

The best herd of ten cows averaged 44lbs. milk and 2.054lbs. butter fat per cow per day, equal to 635.0lbs. fat for one month from 10 cows.

The worst herd of ten cows averaged 16.15lbs. milk and .748lbs. butter fat per cow per day, equal to 231lbs. fat for one month from 10 cows.

The best cow produced 53lbs. milk, an average test of 5.99 per cent., equal to 3.178lbs. butter fat for 24 hours. This is equal to 3.734lbs. commercial butter for 24 hours; 26.13lbs. commercial butter for one week; and 112 lbs. commercial butter for one month.

The worst cow produced 19lbs. milk, an average test of 2.8 per cent., .533lbs. butter fat for 24 hours, .626lbs. commercial butter for 24 hours, equal to 4.382lbs. commercial butter for one week, or 18.78lbs. commercial butter for one month.

Single Test of Cows not reliable.—Whilst it is not desired, in any way, to advise against one test of a cow, it is pointed out that a single test as a guide is not reliable in assessing the cow's true worth. This aspect is quoted in view of the fact that buyers are often influenced by the fact that a cow is stated to have given, say, four gallons of milk testing five per cent., or that

The Winning Herd in the Bunbury Competition.

such and such a cow tests six per cent. A cow's test invariably increases in percentage of fat towards the end of the lactation period. A cow's test also varies, as a rule, between the morning and evening's milk, the evening's test generally being much higher than that of the morning, especially in the case where the intervals between the hours of the morning and evening milking are at much variance.

As an instance of how one may be deluded regarding the value of a cow on a single test, the production results of half a dozen cows which were under official test, are given:—

	Yield at First Month's Test, after calving.		Yield at Sixth Month's after calving.	
Cow No. 1 ...	40lbs Milk 1·916lbs. Fat	equal so 57·48lbs. Fat for 30 days.	9lbs. Milk ·555lbs. Fat	equal to 16·65lbs. Fat for 30 days.
Cow No. 2 ...	35lbs. Milk 2·057lbs. Fat	equal to 61·71lbs. Fat for 30 days.	8lbs. Milk ·484lbs. Fat	equal to 14·52lbs. Fat for 30 days.
Cow No. 3 ...	35lbs. Milk 1·430lbs Fat	equal to 42·90lbs. Fat for 30 days.	6lbs. Milk ·311lbs. Fat	equal to 9·33lbs. Fat for 30 days.
Cow No. 4 ...	31lbs. Milk ·955lbs. Fat	equal to 28·65lbs. Fat for 30 days.	8½lbs. Milk ·465 lbs. Fat	equal to 13·95lbs. Fat for 30 days.
Cow No. 5 ...	41lbs. Milk 1·636lbs. Fat	equal to 49·08lbs. Fat for 30 days.	8½lbs. Milk ·422lbs. Fat	equal to 12·66lbs. Fat for 30 days.
Cow No. 6 ...	31lbs. Milk 1·333lbs. Fat	equal to 39·99lbs. Fat for 30 days.	4lbs. Milk ·18lbs. Fat	equal to 5·4lbs. Fat for 30 days.

On examining the above figures, it will be noticed that cows, Nos. 1 and 2, stand out on their first month's test—after calving—as particularly high producers, and cows, Nos. 3 and 5, on their first month's test are also good producers. It will be seen, however, in comparing their yield at the sixth month after calving, that they are what are known by Herd Testing Associations to be "sprinters" and not "stayers." For instance, cow No. 1, which was yielding 57.48lbs. fat on her first month's test, dropped to 16.65lbs. fat at her sixth month, and cow No. 6, which was yielding 39.99lbs. fat on her first month's test, only produced 5.4lbs. fat at her sixth month's test.

Test Records at Sales.—Test records influence the sale of dairy stock very materially when owners have occasion to sell surplus stock, or in the case of a clearing out sale. It is now generally recognised by all thinking dairy farmers that, in purchasing dairy stock, the necessity of some guide as to the production of the animal being purchased or the production of its dam and sire's dam is essential. I have before me at the moment the catalogue of the Dispersal Sale of Mr. D. J. Goyder's Jersey cattle at Roelands Park, Roelands. The information contained regarding each animal offered, apart from the pedigree, supplies the production record of the animal offered or that of its dam and sire's dam, and in assisting buyers it is exceedingly valuable. As time goes on, purchasers of dairy stock will demand such records to accompany animals before they will purchase.

Conclusion.—The answer to low prices of dairy products and increased cost of production is increased unit or *average cow* production.

The use of the scales and the Babcock tester is the secret to profitable dairying.

The dairyman's slogan in the development of his herd should be:—

"BREED," "FEED," "WEED."

THE DIFFERENCE IN COWS.

This cow produced 6,183lbs. of milk and 308.6lbs. of butter fat in 322 days.

This cow produced 2,730lbs. of milk and 143lbs. of butter fat in 291 days.

REPAIRING CONCRETE WALLS.

Usually when the inside of a concrete or other masonary silo is plastered the walls are not yet rigid. Subsequent checking and cracking often follow, and the owner wonders why, yet fails to take the time to repair them. Surface checks usually do no harm, and are often the result of excessive strain on the surface when the water evaporates. But if the checks are cracks and extend through the wall, they should be repaired. Pure cement wash is perhaps as good as anything. But to make the wash bond perfectly with the old concrete, the surface should be soaked with water for several minutes before the wash is applied. The wash should be of the consistency of thick cream first, then thickened until it will just pour. Large cracks which may require a flexible joint are repaired by heating with a blowtorch until the surrounding surface is warm. Asphalt-soaked rags are then tamped in with a hammer and a hardwood stick, and then covered with pure asphalt or heavy tar. These hints will apply also to cisterns or water tanks.—"Country Gentleman."

DAIRY HERD IMPROVEMENT.

P. G. Hampshire,
Dairy Expert.

List of registered pure cows which have been officially tested and exceed the required production, enabling their male progeny to be eligible for purchase by the Government with the view of improving the dairy herds of Western Australia.

Following upon the Department's policy of urging the use of registered pure sires ex dams with official butter fat production of such merit as will enable the progeny of these cows to be the means of improving the progeny of the average production cows of the State, the following is a list of all standard cows which have been officially tested to date. When the scheme for dividing the State into zones for the use of registered pure bulls ex these proved production cows was launched, it was noted the success of such a scheme would depend upon continuity of policy, and following on the use of the male progeny of standard cows it is confidently expected that material advance will be made in the production of the average cow in each of the zones through their progeny.

The Government has laid down that the only bulls that will be purchased for distribution to group settlers and others must be the progeny of cows with a production record above the standard decided upon. The information shown in this and the next issue of the *Journal* gives the name of owner, name of cow, breed, herd book number, weight of milk for period, average test, total butter-fat and standard required—lbs. of fat. In confirmation of circular issued on 29th May, 1924, the standard of production over a period of 273 days' test is 166 lbs. fat (or 200 lbs. commercial butter) in the case of a heifer on first calf, 207 lbs. fat (or 250 lbs. commercial butter) in the case of a cow under four years, and 249 lbs. fat (or 300 lbs. commercial butter) in the case of a mature cow.

Name of Cow.	Owner.	Breed.	Herd Book No.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Standard required (lbs. fat.)
				lbs.	%	lbs.	
Collingwoods Gladys	D. J. Goyder...	Jersey ...	5,909	4,224	5·43	232·23	166
Brighton Queen III. of St. Lambert	do. ...	do. ...	5,292	4,719	5·01	240·18	166
Retford Buttercup II.	do. ...	do. ...	6,830	4,059	6·56	266·50	166
Jean of Dardanup	do. ...	do. ...	9,989	5,108	4·60	235·10	166
Lyracleas Favourite	do. ...	do. ...	6,823	7,397	5·04	373·06	166
Lulu of Tellaraga	do. ...	do. ...	4,793	6,988	4·82	336·95	249
Island Cream of Roelands ...	do. ...	do. ...	6,822	5,417	5·89	319·48	166
Jean II. of Dardanup	R. H. Rose ...	do. ...	8,475	6,598	4·22	281·20	249
Obligato	D. J. Goyder	do. ...	4,964	5,989	5·10	305·56	249
Lily II. of Dardanup	R. H. Rose ...	do. ...	8,946	5,599	5·22	292·47	166
Daisy of Grassvale	do. ...	do. ...	8,473	4,822	5·36	258·55	207
Mokine Empire's Lily III. ...	T. H. Wilding	do. ...	10,049	6,206	5·75	357·35	249
Mokine Orange Lily	do. ...	do. ...	10,014	4,849	5·88	285·47	249
Romany Maid of Tarnfirr ...	P. Rose ...	do. ...	6,036	5,274	5·48	289·39	207
Maitland Zingara	D. J. Goyder...	do. ...	3,086	6,334	5·15	325·98	249
Carnation of Dardanup ...	R. H. Rose ...	do. ...	9,995	4,767	5·25	250·62	166
Jessie of Dardanup	do. ...	do. ...	8,945	5,456	5·00	277·23	166
Noreena of Tellaraga	D. J. Goyder	do. ...	6,828	4,753	5·19	246·61	166
Pansy III. of Penryn	do. ...	do. ...	5,192	5,974	5·59	333·90	249
Pretty Maid of Roelands ...	do. ...	do. ...	5,911	6,239	4·44	277·92	249
Noreen 5th, of Banyule ...	W. Padbury ...	do. ...	7,125	3,644	5·64	205·51	166
Mokine Lady Guildford III. ...	T. H. Wilding	do. ...	10,634	5,366	5·92	317·89	249
Jean of Dardanup	D. J. Goyder	do. ...	9,989	4,805	4·56	219·24	207
Lydia 5th of Yaralla	do. ...	do. ...	6,826	4,392	4·84	212·92	166
Beauty 3rd, Wangara of Pine Hill	R. H. Rose ...	do. ...	6,134	5,562	4·89	272·40	207
Antimony's Elvira	T. L. Rose ...	do. ...	8,465	5,655	5·31	300·27	249
Luxe of Yarralla	D. J. Goyder	do. ...	6,825	6,599	4·65	306·96	207
Morden Lady V., of Waterville	A. W. Padbury	Guernsey	130	9,680	4·42	428·26	249
Yarraview Silver Susan ...	do. ...	do. ...	406	6,274	4·94	310·24	249
Yarraview Isabel	do. ...	do. ...	397	4,929	5·15	254·21	207
Topsy of Grassvale	R. H. Rose ...	Jersey ...	10,101	6,205	5·51	348·63	249
Lyracleas Favourite	D. J. Goyder	do. ...	6,823	7,173	5·24	376·18	207
Retford Buttercup II.	do. ...	do. ...	6,830	4,856	6·08	295·37	207
Island Cream of Roelands ...	do. ...	do. ...	6,822	4,797	5·40	258·84	207
Daisy of Grassvale	R. H. Rose ...	do. ...	8,473	4,687	5·69	266·94	249
Carnation of Dardanup ...	R. H. Rose ...	do. ...	9,995	4,930	5·20	256·47	207
Jessie of Dardanup	do. ...	do. ...	8,945	5,056	4·83	244·36	207
Lady Mints Gem	W. Padbury ...	do. ...	8,459	5,034	5·61	282·84	249
Brightlass of Woollingurry ...	D. J. Goyder	do. ...	6,818	7,540	5·05	380·62	207
Yarraview Junket	A. W. Padbury	Guernsey	399	5,531	5·15	285·05	249
Gaylass of Koojan	do. ...	do. ...	630	4,502	5·68	255·91	166
Lily II. of Dardanup	R. H. Rose ...	Jersey ...	8,946	6,173	5·06	312·43	207
Lady Betty II. of Koojan ...	A. W. Padbury	Guernsey	N.Y.A.	6,542	4·47	292·88	207
Favourite of Roelands	D. J. Goyder ...	Jersey ...	6,819	4,740	5·15	244·17	166
Daisy 6th of Melrose	W. Padbury ...	do. ...	4,512	7,240	5·19	375·17	249
Lady Mints Gem	do. ...	do. ...	8,459	5,148	5·64	290·67	249
Fondant 9th of Garden Hill ...	do. ...	do. ...	8,456	4,727	5·61	265·31	207
Yarraview Bonnie Annie ...	A. W. Padbury	Guernsey	564	6,665	6·27	418·20	207
Noraleda	D. J. Goyder	Jersey ...	4,794	6,546	4·77	312·19	249
Noreena of Tellaraga	do. ...	do. ...	6,828	6,468	5·34	345·49	207
Carlotta of Ventrim	T. L. Rose ...	do. ...	8,467	5,939	5·36	318·29	207
Magnolia III., of Southbridge...	R. H. Rose ...	do. ...	7,287	3,755	6·24	234·52	207
Maitland Zingara	D. J. Goyder...	do. ...	3,086	7,092	4·99	353·32	249
Jean of Dardanup	do. ...	do. ...	9,989	5,502	4·47	245·97	207
Fancy of Ventonia	T. L. Rose ...	do. ...	8,648	7,590	6·07	461·05	249
Antimony's Elvira	do. ...	do. ...	8,465	7,313	5·36	391·91	249
Lydia 5th of Yarralla	D. J. Goyder...	do. ...	6,826	6,274	5·44	341·63	207
Veronica of Tarnfirr	do. ...	do. ...	5,174	6,330	4·65	294·29	249
Noble Lass 2nd of Yaralla ...	do. ...	do. ...	6,825	4,989	5·39	268·93	207
Rhodesia 5th of Penryn ...	T. L. Rose ...	do. ...	8,470	7,497	4·51	338·45	249
Jean 2nd of Dardanup ...	R. H. Rose ...	do. ...	8,475	6,035	4·33	261·73	249
Beauty 3rd Wangarra of Pine Hill	do. ...	do. ...	6,134	6,345	4·42	280·54	249
Milkmaid of Grassvale	do. ...	do. ...	8,472	4,422	4·78	211·62	166
Maranora of Tellarraga ...	do. ...	do. ...	6,707	6,297	4·93	310·66	249
Lyracleas Favourite	D. J. Goyder	do. ...	6,823	8,925	5·28	472·09	249
Fondant 3rd of Garden Hill ...	W. Padbury ...	do. ...	7,224	7,821	5·34	418·28	249
Wild Rose 2nd of Garden Hill	do. ...	do. ...	10,091	5,519	5·70	314·78	249
Rhodora IV.	D. Malcolm ...	do. ...	4,763	6,447	5·27	339·95	249
Madge of Dalebank	do. ...	do. ...	4,759	5,822	5·83	339·73	249
Queen of Roelands	do. ...	do. ...	6,829	5,273	4·87	256·67	166
Milton's Rosebud	A. W. Padbury	Guernsey	500	4,986	4·71	239·93	166
Obligato	D. J. Goyder...	Jersey ...	4,964	6,168	4·79	295·45	249
Milton's Syringa	A. W. Padbury	Guernsey	503	3,617	5·84	211·34	166
Lady Fowler V. of Dardanup ...	T. L. Rose ...	Jersey ...	9,990	5,591	4·96	277·38	249
Lady Mint's Gem II.	W. Padbury ...	do. ...	8,460	4,338	5·44	236·17	166
Daisy of Grassvale	R. H. Rose ...	do. ...	8,473	5,529	5·66	313·13	249
Yarraview Glaydes	A. W. Padbury	Guernsey	783	3,605	5·77	208·18	166
Morden Lady V. of Waterville	do. ...	do. ...	130	9,363	4·09	382·96	249

Name of Cow.	Owner.	Breed.	Herd Book No.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Standard required (lbs. fat.)
				lbs.	%	lbs.	
Mayflower of Koogan	A. W. Padbury	Guernsey	679	3,751	5·93	222·46	207
Icecream of Glen Iris	W. Padbury ...	Jersey ...	7,110	4,000	5·31	212·48	166
Lulumar of Tellarraga	R. H. Rose ..	do. ...	6,706	5,723	4·82	276·19	249
Jessie of Dardanup	do. ..	do. ...	8,945	5,141	4·87	250·42	249
Creamy of Dardanup	do. ...	do. ...	8,941	4,816	5·64	271·61	249
Yarraview Silver Susan ...	A. W. Padbury	Guernsey	406	5,436	4·71	256·54	249
Fairy of Dardanup	R. H. Rose ...	Jersey ...	8,942	7,655	4·46	342·08	207
Lady Fowler of Roelands ...	D. J. Goyder	do. ...	9,991	5,811	5·30	308·35	249
Brightlass of Wollingurry ...	do. ...	do. ...	6,818	7,846	5·58	438·36	249
Modest 2nd of Homeleigh ...	D. Malcolm ..	I.M.S. ...	Vol. 2	5,099	3·96	202·20	166
Girlie of Sarnia	do. ...	Jersey ...	9,992	9,038	4·78	432·78	207
Flavoria of Banyule	Dept. of Agriculture	do. ...	8,489	5,315	5·80	308·57	249
Yarraview Georgina	A. W. Padbury	Guernsey	782	4,604	5·34	246·25	166
May of Grassvale	R. H. Rose ...	Jersey	9,997	3,839	5·34	205·07	166
Jean 2nd of Grassvale	do. ...	do. ...	9,996	4,329	5·90	255·43	166
Twylish Madeira of Roelands ...	D. Malcolm ...	do. ...	6,832	3,918	5·90	231·23	166
Lady Betty 2nd of Koogan ...	A. W. Padbury	Guernsey	N.Y.A.	5,717	4·65	266·14	249
Gay Lass of Koogan	do. ...	do. ...	630	4,516	6·15	277·19	207
Retford Buttercup 2nd ...	D. J. Goyder...	Jersey ...	6,830	7,488	6·50	487·25	249
Mystery 20th of Melrose ...	D. Malcolm ...	do. ...	8,450	6,610	6·34	419·55	249
Jessimia XI. of King's Vale ...	do. ...	do. ...	6,339	6,008	4·51	271·01	249
Daisy of Garden Hill	W. Padbury ...	do. ...	10,628	3,597	6·06	218·02	166
Yarraview Bonnie Annie ...	A. W. Padbury	Guernsey	564	6,189	6·33	392·01	249
Wisteria 2nd of Homeleigh ...	D. Malcolm ...	I.M.S. ...	Vol. 2	6,769	4·47	303·09	166
Rhodora IV.	do. ...	Jersey ...	4,763	9,746	5·38	524·54	249
Maranora of Tellaraga	R. H. Rose ...	do. ...	6,707	9,081	4·74	430·40	249
Rhodora 2nd of Dalebank ...	D. Malcolm ...	Jersey ...	8,451	5,111	5·82	297·52	166
Jean 2nd of Dardanup ...	R. H. Rose ...	do. ...	8,475	8,304	4·20	349·27	249
Fondant 6th of Garden Hill ...	W. Padbury ...	do. ...	8,455	4,484	5·81	260·60	249
Obligato	D. J. Goyder	do. ...	4,964	6,200	5·11	318·99	249
Lydia 5th of Yarralla	do. ...	do. ...	6,826	6,453	5·32	343·47	249
Madge 2nd of Dalebank ...	D. Malcolm ...	do. ...	8,449	4,536	5·56	252·31	166
Daisy of Grassvale	R. H. Rose ...	do. ...	8,473	7,690	5·37	413·56	249
Noreen of Garden Hill ...	W. Padbury ...	do. ...	11,662	3,218	5·48	176·36	166
Morden Lady of Koogan ...	A. W. Padbury	Guernsey	722	7,473	3·83	286·46	166
Shiela of Sarnia	D. Malcolm ...	Jersey ...	8,452	6,178	5·70	352·46	166
Milton's Rosebud	A. W. Padbury	Guernsey	500	6,048	4·27	258·25	207
Buttercup of Roelands ...	D. J. Goyder	Jersey ...	10,616	3,528	5·71	201·56	166
Retford Wonder 2nd	D. Malcolm ...	do. ...	4,435	6,195	6·25	387·18	249
Noble Jessie IV. of Banyule ...	Department of Agriculture	do. ...	8,490	4,431	5·29	234·79	207
Wild Rose 2nd of Garden Hill	W. Padbury ...	do. ...	10,091	7,464	5·92	441·96	249
Icecream of Glen Iris	do. ...	do. ...	7,110	4,674	5·48	256·21	207
Lulu 2nd of Roelands	D. J. Goyder...	do. ...	10,614	4,531	4·77	216·52	166
Beauty 3rd, Wangara of Pine Hill	R. H. Rose ...	do. ...	6,134	6,885	4·37	300·84	249
Queen of Roelands	D. Malcolm ...	do. ...	6,829	4,836	4·92	238·02	207
Yarraview Glaydes	A. W. Padbury	Guernsey	783	5,022	5·01	251·76	207
Milton's Syringa	do	do. ...	503	4,095	5·69	233·07	207
Lux of Yarralla	D. J. Goyder...	Jersey ...	6,825	8,376	4·61	386·76	249
Lydia of Roelands	do. ...	do. ...	11,431	4,566	4·94	225·99	166
Retford Tessie	W. Padbury ...	do. ...	8,464	3,577	5·91	211·42	207
Jean of Grassvale	R. H. Rose ...	do. ...	8,476	4,880	4·64	226·75	207
Carnation of Dardanup ...	do. ...	do. ...	9,995	8,870	5·35	474·87	249
Jessie of Dardanup	do. ...	do. ...	8,945	7,434	5·07	377·04	249
Lyracleas Favourite	D. J. Goyder	do. ...	6,823	11,462	5·01	574·23	249
Clematis of Gleniris	W. Padbury ...	do. ...	7,108	6,042	5·91	357·16	249
Treasure 3rd of Homeleigh ...	D. Malcolm ...	M.S. ...	Vol. 2	8,805	4·34	382·87	166
Golden Creafn of Roelands ...	D. J. Goyder...	Jersey ...	10,617	4,860	5·19	252·27	166
Boronia of Grassvale	R. H. Rose ...	do. ...	9,994	6,675	4·94	330·07	207
Lily 2nd of Dardanup	do. ...	do. ...	8,946	7,933	4·92	390·16	249
Creamy of Dardanup	do. ...	do. ...	8,941	6,197	4·99	309·44	249
Silver Belle of Roelands ...	A. H. Henning	do. ...	10,047	5,820	4·62	269·32	249
Fondant 3rd of Garden Hill ...	W. Padbury ...	do. ...	7,224	9,037	5·52	499·64	249
Lady Fowler 2nd of Dardanup	R. H. Rose ...	do. ...	10,003	6,252	4·65	290·63	249
Lady of Inglewood	D. Malcolm ...	do. ...	5,910	5,898	5·62	331·46	249
Girlie 2nd of Sarnia	do. ...	Jersey ...	11,633	7,140	4·13	295·36	166
Lily of Roelands	D. J. Goyder...	do. ...	10,619	4,881	4·43	216·64	166
Fairy of Dardanup	R. H. Rose ...	do. ...	8,942	8,305	4·75	395·05	249
Mamselle Mimi of Hamel Lea...	A. H. Henning	do. ...	10,046	5,166	5·37	277·85	207
Brightlass of Wollingurry ...	D. J. Goyder	do. ...	6,818	11,289	4·93	556·74	249
Lily of Grassvale	R. H. Rose ...	do. ...	8,947	7,482	5·00	374·63	166
Pet 8th of Glenira	D. Malcolm ...	M.S. ...	...	5,802	4·67	270·98	166
Retford Violet	W. Padbury ...	Jersey ...	6,938	6,528	5·78	348·08	249
Favourite of Roelands	D. J. Goyder...	do. ...	6,819	7,697	5·02	396·37	207
Morden Lady V. of Waterville	A. W. Padbury	Guernsey	130	10,290	4·24	437·21	249
Lady Fowler 12th of Dardanup	R. H. Rose ...	Jersey ...	10,011	6,970	4·75	332·25	166
Pride III. of Black Heath ...	Wooroloo Sanatorium	M.S. ...	N.Y.A.	7,049	3·73	263·52	166

Name of Cow.	Owner.	Breed.	Herd Book No.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Standard required (lbs. fat.)
				lbs.	%	lbs.	
Milton's Daisy	A. W. Padbury	Guernsey	N.Y.A.	5,515	5·47	278·37	166
Picton's Trequean Flirt ...	do.	do. ...	747	5,566	4·74	264·20	166
Mokine Empire's Lily VI. ...	T. H. Wilding	Jersey ...	10,636	6,120	6·19	380·57	166
Gladys of Roelands	D. J. Goyder...	do. ...	6,821	5,763	5·53	318·93	207
Daisy VI. of Melrose	W. Padbury ...	do. ...	4,512	10,605	5·18	550·05	249
Wisteria 2nd of Homeleigh ...	D. Malcolm ...	I.M.S. ...	N.Y.A.	6,184	3·94	243·85	207
Jean II. of Grassvale	R. H. Rose ...	Jersey	9,996	8,701	5·84	508·93	207
Cocky of Claremont	Hospital for Insane	M.S. ...	N.Y.A.	10,296	4·02	414·25	249
May of Blackheath	Wooroloo Sanatorium	do. ...	N.Y.A.	10,065	3·84	386·56	166
Maranora of Tellarraga ...	R. H. Rose ...	Jersey	6,707	10,533	5·05	531·90	249
Dorinda 4th of Dardanup ...	P. Rose ...	do. ...	9,993	5,713	5·50	314·38	249
Blossom of Moorlands	do. ...	do. ...	8,926	4,476	5·27	236·20	166
Lass of Moorlands	do. ...	do. ...	8,939	4,917	5·44	284·81	207
Myrtle of Merridale	do. ...	do. ...	8,928	4,828	5·44	262·85	249
Overton Mary	W. G. Burgess	Ayrshire	2,601	7,994	4·38	350·51	249
Marge of Oakbank	do. ...	do. ...	6,161	6,043	4·41	266·52	249
Tipperary Mona	do. ...	do. ...	6,165	6,568	4·88	320·58	249
Fuchsia of Gleneira	do. ...	do. ...	8,514	6,813	4·52	307·89	166
Quality of Oakbank	do. ...	do. ...	6,163	7,042	3·70	260·87	249
Winifred of Oakbank	do. ...	do. ...	6,167	8,475	4·02	341·07	249

(*List continued next issue of "Journal."*)

FLAX CULTIVATION.

Australia's Opportunity.

That the excellent prices being realised for flax and the great shortage of this fibre represents a unique opportunity for establishing this valuable industry in Australia is the opinion of Mr. F. Strachan, an expert on this question, who is endeavouring to arouse interest in flax growing. He is at present in Riverina for that purpose.

Prior to the war, states Mr. Strachan, flax fibre brought £80 per ton, and cotton £40. Now cotton was £120, and flax realised an average of £180. An excellent flax plot was grown at Eden (New South Wales) last year by a farmer named Wellings. Sown in May, it was harvested in December. A succession of frosts, some very heavy, attended it until September. Its height was 31 inches. The fibre was equal to the Irish, and was valued at £180. The linseed was equal to the best Victorian, fetching at present £22 per ton. The shortage of flax fibre in the European markets was equal to the whole of the Australian wool export, over 2,000,000 bales. At an average price of, say, even £130, the value of this flax shortage would be £40,000,000. In the Geelong district of Victoria a start had been made by private enterprise. This year 260 acres were being harvested and treated at a small mill. A company had been formed to promote the industry in that part of Victoria. An average of two tons of flax hay was obtained by the growers. Several acres averaged 2½ tons, and one of five acres was reported at the time of his recent inspection to have reached 3½ tons per acre. The price given by the miller for the hay was £5 per ton, equal to about 33 bushels of wheat at 6s. It must be pointed out, however, that with improved, up-to-date machinery an even higher price would be paid growers.

HERD TESTING.

WESTERN AUSTRALIAN OFFICIAL HERD TESTING RESULTS FOR QUARTER ENDING FEBRUARY, 1925.

Conducted by Officers of Dairy Branch.

Name of Cow.	Owner.	Breed.	Herd Book No.	Age at beginning of Test.	Date of Calving.	No. of Days in Test.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Weight of Milk Last day of Test.	Remarks.
MATURE COWS—STANDARD REQUIRED 350 LBS. OF BUTTER FAT—273 DAYS.											
				Yrs. Mths.			lbs.	%	lbs.	lbs.	
Maranora of Tellegara	R. H. Rose ...	Jersey ...	6707	7 2	16–5–24	273	11,509	5·04	580·48	26½	
Fairy of Dardanup	do.	do. ...	8942	6 4	20–5–24	273	11,235	4·80	539·41	30	
SENIOR 4 YEARS OLD (OVER 4½ YEARS AND UNDER 5 YEARS)—STANDARD 325 LBS. BUTTER FAT.											
Bolebek Judith	A. L. B. Lefroy ...	Friesian ...	291	4 9	23–5–24	273	14,164	3·16	448·72	36½	
Bolebek Dorothea	do. ...	do. ...	293	4 9	14–4–24	273	7,306	3·78	276·88	15½	
JUNIOR 4 YEARS OLD (OVER 4 YEARS AND UNDER 4½ YEARS)—STANDARD 300 LBS. OF BUTTER FAT.											
Lady Fobes Veeman	A. L. B. Lefroy ...	Friesian ...	U.S.A. 620852	4 5	11–4–24	273	16,533	3·17	524·88	46	
Bolebek Frieda	do.	do. ...	1116	4 1	17–2–24	273	8,664	3·50	303·79	23	
SENIOR 3 YEARS OLD (OVER 3½ YEARS AND UNDER 4 YEARS)—STANDARD 275 LBS. OF BUTTER FAT.											
Bolebek Dulcina	A. L. B. Lefroy ...	Friesian ...	1120	3 9	26–4–24	273	8,475	3·62	307·16	25	
JUNIOR 3 YEARS OLD (OVER 3 YEARS AND UNDER 3½ YEARS)—STANDARD 250 LBS. OF BUTTER FAT.											
Bolebek Roma	A. L. B. Lefroy ...	Friesian ...	1124	3 4	7–4–24	273	8,286	3·75	310·91	22	
SENIOR HEIFERS (UNDER 3 YEARS AND OVER 2½ YEARS)—STANDARD 225 LBS. OF BUTTER FAT.											
Milton's Dulcie II.	A. W. Padbury ...	Guernsey	928	2 8	14–4–24	273	8,571	5·06	433·93	27	
Beauty of Sarnia	D. Malcolm ...	Jersey ...	12086	2 9	3–5–24	273	2,325	5·61	130·55	5	
JUNIOR HEIFERS (UNDER 2½ YEARS)—STANDARD 200 LBS. OF BUTTER FAT.											
Mokine Clove Carnation ...	Mesdames Walker & Co.	Jersey ...	11796	2 5	2 4–24	273	4,779	6·70	320·52	13	
Myrtle 12th of Greyleigh ...	D. Malcolm ...	M.S. ...	N.Y.A.	2 3	26–4–24	273	4,557	4·04	184·49	4	

REGULATIONS UNDER "THE STOCK DISEASES ACT, 1895."

Compulsory Dipping Area.

South-West Division of the State South of the Eastern Railway.

32. (a) Every owner of sheep within the boundaries of that part of the South-West Division South of the Eastern Railway shall after the shearing of such sheep and before the 30th day of April in each year, dip or cause to be dipped, in a swim bath prepared with some specific known to be fatal to ticks and lice, all sheep running on land whereof he is the owner or occupier.

(c) For every sheep not dipped as provided in this regulation, within the period prescribed above, the owner shall be liable to a fine not exceeding two shillings.

South-West Division of the State North of the Eastern Railway.

32. (b) Every owner of sheep within the boundaries of that part of the South-West Division North of the Eastern Railway shall, after the shearing of such sheep and before the 28th February in each year, dip or cause to be dipped, in a swim bath prepared with some specific known to be fatal to ticks and lice, all sheep running on land whereof he is the owner or occupier.

Ewes with lambs—time for dipping.

33. Nothwithstanding anything contained in these regulations, it shall not be necessary to dip ewes affected with ticks or lice during such time previous to or after their lambing as the inspectors may appoint, and for such purpose any inspector may, in respect of such ewes, extend any notice to dip for such time as he shall think fit.

Statutory Declaration to be supplied within seven days after dipping.

34. Within seven days after the dipping of his sheep the owner shall make a statutory declaration before a justice of the peace, to the effect of Schedule 5a hereto, stating that he has dipped his sheep in accordance with the provisions of these regulations, the date of dipping, the number of sheep dipped, and the class of dip used, and he shall forward such declaration to the police officer in charge of the police station nearest to him. Such declaration shall be forwarded by the said police officer to the Chief Inspector of Stock.

Permits to move sheep in the Gascoyne.

Every owner of sheep in the area defined in the Schedule hereto must, before travelling or removing or causing to be removed, or attempting to remove, any sheep to any place outside the said area, obtain a permit to remove such sheep from an inspector of stock, who shall not issue the said permit unless he is satisfied that the sheep intended to be so removed out of

the prescribed area are free from parasites known as tick and lice; and every person contravening this regulation by act or omission shall be punishable summarily, and upon conviction be liable to a penalty not exceeding one hundred pounds and not less than fifty pounds.

Schedule.

That portion of the State bounded on the South by the Northern boundary of the South-West Division, commencing at the sea-coast and proceeding as far as the intersection of such boundary with the 115.5 meridian of longitude; thence following such meridian Northerly to the intersection of the sea-coast; thence along the sea-coast to the starting point.

Lice or tick-infested sheep in any part of the State.

36. (a) If an inspector is satisfied that a flock depasturing in any part of the State is affected with tick or lice, he shall give the owner thereof notice to dip such stock forthwith to the satisfaction of the inspector or his agent.

Provided that the owner who refuses, neglects, or fails to comply with such notice on or before the date specified therein shall be liable on conviction to a penalty not exceeding fifty pounds for the first offence, and if immediately after conviction for the first offence such sheep shall not be dipped to the entire satisfaction of the inspector, such owner shall upon conviction be liable to a further penalty not exceeding fifty pounds, and so on for each and every succeeding conviction.

Tick or lice on sheep exposed in a public market or exhibited for show purposes or any other place where offered for sale.

36. (b) If any sheep affected with tick or lice shall be found in any pound, or in any yard or yards, or on any land or other place at which sheep are offered for sale or exhibited for show purposes, the owner exposing the sheep so affected shall be liable to a penalty not exceeding fifty pounds: Provided that any inspector, if he deems it necessary, may order the withdrawal from sale of any sheep affected with ticks or lice until such sheep have been dipped or dressed to the satisfaction of such inspector or any other inspector, and shall give notice to the aforesaid owner of such sheep to dip or dress the same forthwith, at such place as the inspector may direct; and every such owner who refuses, neglects, or fails to comply with the aforesaid notice is liable to a further penalty not exceeding twenty pounds. But if the inspector is satisfied that such sheep are intended for immediate slaughter, he may withhold such notice to dip.

CLUSTER CLOVER.

(Trifolium glomeratum.)

W. M. Carne and C. A. Gardner, Botanical Branch, and
A. B. Adams, Dipl. Agric., Agricultural Adviser.

Cluster clover is one of the most useful of the annual pasture plants in this State. It is widely distributed, and amongst the clovers is probably next to Subterranean in importance. It occurs more or less plentifully throughout the well watered South-West, especially on the better drained soils. It does not thrive on wet soils. In the drier areas it is superior to Subterranean Clover, as it will grow and produce seed under conditions that are generally too dry for the latter. Where both thrive Subterranean Clover must be regarded as the better plant, as it is more vigorous and produces a greater bulk of feed.

Cluster clover will probably succeed as far East as Kellerberrin, but it cannot be expected to thrive in drier areas.

In common with most of our leguminous pasture plants, Cluster Clover responds well to topdressing with superphosphate. Without the presence of phosphatic fertilisers it may live and seed, but the plants are usually so small as to be barely noticeable. Following topdessing the clover grows vigorously and produces quantities of seed. In many cases 30 cwts. of clover hay may be obtained from an acre.

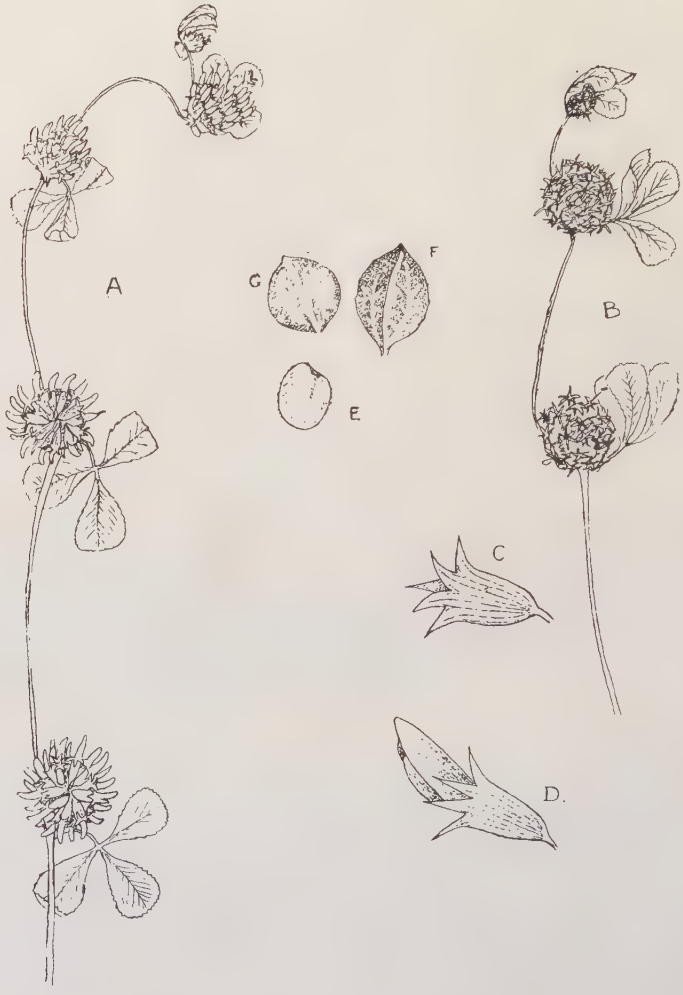
Unlike Burr Clover (*Medicago denticulata*) Cluster Clover seeds well even when heavily stocked with sheep. For this reason, together with the fact that a large proportion of the seeds are hard shelled, once it is established on suitable land it is extremely unlikely to die out.

Cluster clover is very nutritious and palatable for all classes of stock. As the seed heads are not spiny the seed is not distributed as readily by stock as Burr Clover, but nevertheless stock do spread the seed through their droppings and by carrying the seed heads. At the same time the absence of spines on the seed heads prevents them becoming a nuisance in wool.

This clover has one disadvantage. Although it germinates with the first rains in the autumn, it does not make much growth until the weather starts to warm up in the spring.

Being such a useful plant it will pay the farmer to introduce it on his farm if it is not already growing there. The seed is cheap, and being very small a few pounds sown over a burn or with a crop will give a stand over a good area. Once it is established it can be helped to spread by sweeping up the seed and sowing on fresh land, as although it will eventually be carried by stock it will spread much more rapidly with a little help.

The seed is very small, about 1,500,000 going to the pound. The percentage of hard seeds is very high, ranging from 65 per cent. to 94 per cent. in three samples examined. The immediate germination of these three samples varied from four per cent. to 20 per cent. The hard seeds can be relied upon to germinate during following seasons and especially after a fire. Seed may be purchased at about 1s. 3d. per lb. This seed comes from New Zealand.



CLUSTER CLOVER

(Trifolium glomeratum).

Explanation—A. Flowering branch. B. Seeding branch. C. Calyx (enlarged). D. Flower (enlarged). E. Clover seed. F. Sorrel seed. G. Sorrell seed with husk removed.

It is very variable in quality, and many contain large quantities of other seeds up to 1/3rd of its weight. Many of these seeds are of other clovers and grasses, and are not objectionable. Some samples, however, contain large quantities of sorrel seeds (see plate), and should be avoided.

Sorrel may be recognised as small dark brown seeds slightly larger and readily distinguishable from the light yellow seeds of the clover. They are triangular in cross section with a smooth shining surface, but usually appear dull and rough owing to the presence of a shrivelled husk.

Description.—A hairless annual, with spreading prostrate stems, or when occurring densely more erect. Leaflets three, obovate, obtuse at the apex, finely toothed in the upper parts. Stipules (at the base of the leaves) more or less triangular and long-pointed.

Flowers pink in globular heads without any common stalk, situated at the base of the leaves or at the ends of the branches, the heads usually distant from each other.

Calyx 10-nerved, with short broad teeth spreading or erect in flower, but rigidly bent backwards as the pod ripens. Corolla pink, longer than the calyx, but narrow. Pod enclosed in the calyx, 1-2 seeded. Seeds small, light yellow, almost globular, rough and not shining.

Native of Mediterranean Region and Western Europe.

LOCUSTS.

L. J. Newman, Entomologist.

The advent of summer rains throughout the locust-infested areas has created conditions which make it possible to break up the soil. Advantage should therefore be taken by farmers who are in the infested districts to immediately get to work and break up those areas which they know to contain the locust eggs. The land should not be ploughed too deeply (2½ to 3 inches being sufficient), as this would simply turn the egg tubes over without breaking them.

After ploughing thoroughly work the soil to break up the lumps and expose the tubes and eggs. By so doing, the elements, birds, and insect parasites are enabled to gain access to the eggs, and thus they are destroyed.

The opportunity now presented should not be missed, as it will mean the saving of much labour, damage, and expense later on.

CONCERNING FOXES.

C. J. Craig,
Chief Inspector of Rabbits.

Now that the fox has followed the example of the rabbit, and journeyed West, the following information may prove of interest:—Strangely enough, although odd foxes have been killed in widely separated portions of the State, it is only in the belt of country extending from above Northampton to Geraldton and Mingenew that they are at all numerous. However high a standard the cunning of the fox may have traditionally attained in other directions, in the matter of devouring poison baits its reputation suffers greatly; it is much easier to poison than the dingo, and can rarely resist baits of liver, kidney, kidney fat, and, best of all, birds. The method of preparing the latter is to hold the beak open of a freshly shot parrot or galah and insert a sharp penknife down the throat, cutting the palate and throat slightly. As much powdered strychnine as will lie on the point of an ordinary pocket knife should be placed in the cut made. Baits should, if possible, be laid along a trail, and will attract a fox even when dried. The laying of poison along ridges which foxes frequent for the purpose of having a look round, and along the edge of scrub and thickets which form their retreat, and wherein they rear their young, and the dragging of some trail such as a sheep's paunch and the placing of baits at intervals along the courses taken, are points duly emphasised by all authorities. The finding of a dead lamb with the tongue missing declares the existence of a fox somewhere in the vicinity, and the lamb thus discovered should be poisoned, for the fox will return later on, probably the same or following evening. Foxes are said to be shy of a sheep that has been skinned, but there can be no doubt that their courage is a rising or a receding quantity in proportion to the cravings of hunger, or the needs of a litter of pups. They have been seen to kill a grown sheep, and they have also been seen to be defeated by a ewe defending her lamb. Our ground game, including the wild turkey, will suffer severely if this new pest becomes at all numerous. The writer has known a fox to get over a six-feet wire-netting fence to attack poultry. When fowls are roosting in a tree, a fox will run round and round the tree, especially on a moonlight night until, sooner or later, as though mesmerised, one of the birds will drop on the ground, to be speedily snapped up. I have heard it questioned if the fox will attack sheep if rabbits abound, but the day is past for giving the fox the benefit of the doubt. If some prefer young rabbits to young lambs, that does not prove that all of them do. It is only a matter of time and opportunity for the fox to develop an appetite for the more costly victim.

EXTERNAL PARASITES OF SHEEP.

L. J. Newman, F.E.S., Entomologist.

SHEEP LICE.

Amongst insects which continually live on domestic animals propagate on them, and when their numbers increase cause serious injury to their host, none are perhaps worse than the various species of lice.

During the past few years these parasites have shown considerable increase amongst our flocks. In Eastern Australia it is stated that the heavy annual loss to the material wealth resulting from the presence of lice amongst sheep is immense, being greater than that caused by the so-called Sheep Tick (*Melophaga ovinus*).

Two species of lice have been determined as present and infesting our local sheep, namely, the Red Headed Sheep Louse (*Trichodectus sphaerocephalus*) (*Nitzsch*) and the Foot Louse (*Linognathus pedalis*) (*Osborn*). They belong to the Order *Hemiptera* and to the Sub-Orders *Mallophagidae* and *Anoplura*. In the Sub-Order *Mallophagidae* all members are parasitic, and are known as the biting lice. They do not suck blood by means of a proboscis or beak. Their mouth parts are formed for feeding upon hair, feathers, skin, scales, clots of blood (formed by the infested animal scratching and biting itself) and scabby or other scurvy material found upon the skin or amongst the hair and feathers of their hosts. These lice are most commonly found upon birds. Nearly all farm animals, however, are subject to infestation by some species of this sub-order.

The *Mallophagidae* or biting lice are all small flattened insects, having large prominent head, outstanding eyes, and short, three-jointed antennae or feelers. The legs are short and stout, fitted for holding to and also moving among hair or feathers. The tarsus or foot is terminated with a sharp claw.

The eggs, commonly known as "nits," are fastened to the hair or feathers of the host. The young issue from the eggs in a few days. They resemble their parents, except in size, and reach sexual maturity by a series of moults. Their entire life is passed on the host. They are spread from animal to animal mainly by means of contact. Other mediums of spreading are posts, fence wires, tree trunks, and objects against which the lice-infested sheep scratch themselves. Infested wool is often left clinging to these containing either "nits" or living lice. Clean sheep may rub against these objects and thus become infested.

The second group of lice, namely, the *Anoplura*, are the true blood suckers. They differ primarily from the preceding group in that their mouth parts are formed for piercing the skin and sucking up the blood of their host. Further, they are only found infesting mammals (those animals which suckle their young). Their life history is similar to the biting lice and, therefore, needs no further description at this juncture.

All breeds of sheep appear to be subject to the irritating attacks of lice and tick. Animals attacked by lice are extremely annoyed by them, and fall away considerably in condition, partly by the abstraction of juices and partly by the uneasiness which the itching occasions. We not infrequently observe

Sheep infested with Louse and Tick. Note torn and ragged condition of fleece, due to rubbing.

Tag of wool in mouth of sheep pulled out in its effort to get at the irritation.

sores on the surface of the skin arising either from the gnawing of the lice or from frequent rubbing of the animal against the fence posts, trees, etc. Sheep often tear off their own wool in their endeavour to get at the itching skin.

The presence of lice can be detected by the tufts projecting over the uniform surface of the fleece. The cumulative increase of lice is very rapid, especially upon animals which have become poor in condition through lack of

Infested sheep, showing typical tufts of wool projecting over the uniform surface of fleece.

proper nutritive foods, or due to some disease. The exceedingly prolific increase has led to the vulgar statement that a louse might be a grandfather in 24 hours. This is, of course, not literally true, but simply indicates that where animals which have become infested and probably living under dirty conditions are not attended to, they soon become poor in condition and consequently heavily infested with lice.

Another important fact, other than the loss of weight and ragged texture of the wool, is the depreciation of the fleece by staining, which arises from the excreta of the lice.

THE RED-HEADED SHEEP LOUSE.

(*Trichodectes Sphaerocephalus, Nitzsch.*)

Description.—This little red-headed louse is very small, slightly exceeding 1/25th of an inch when full grown. It is of a pale brownish colour, almost transparent, with the head more dense and reddish, body flattened, head broader than long, eyes outstanding, antennae short and three-jointed,

legs short, thickset, and yellowish, with one terminal claw, eggs or "nits" fastened on to the wool, dirty white, hatching in from six to eight days. The young reach sexual maturity in 16 to 18 days from hatching. Thus we have a complete life cycle every three weeks. The adult insect is apterous or wingless, and may lay 100 or more eggs.

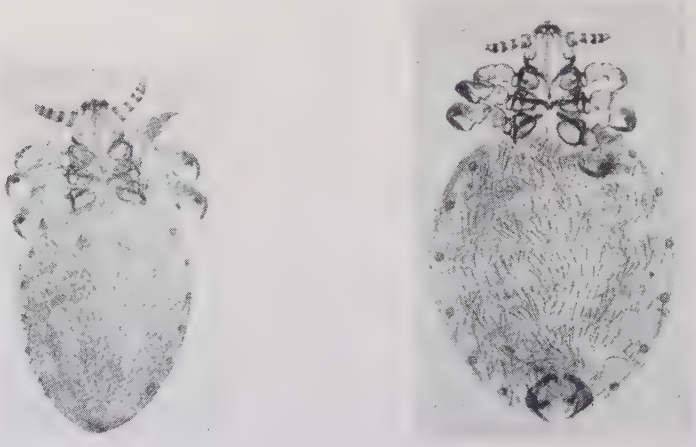
Red-headed Sheep Louse.
Trichodectes sphaerocephalus (*Nitzsch*).
× 50.

This louse is distinguished by the darker dorsal median bands on each of its abdomenal segments, and is only found infesting sheep. It is commonly found near the skin, on the upper parts of the neck, shoulders, back, and thighs. When in great numbers on an animal in low condition, it will be found on all parts of the body.

SHEEP FOOT LOUSE.

(*Linognathus Pedalis, Osborn.*)

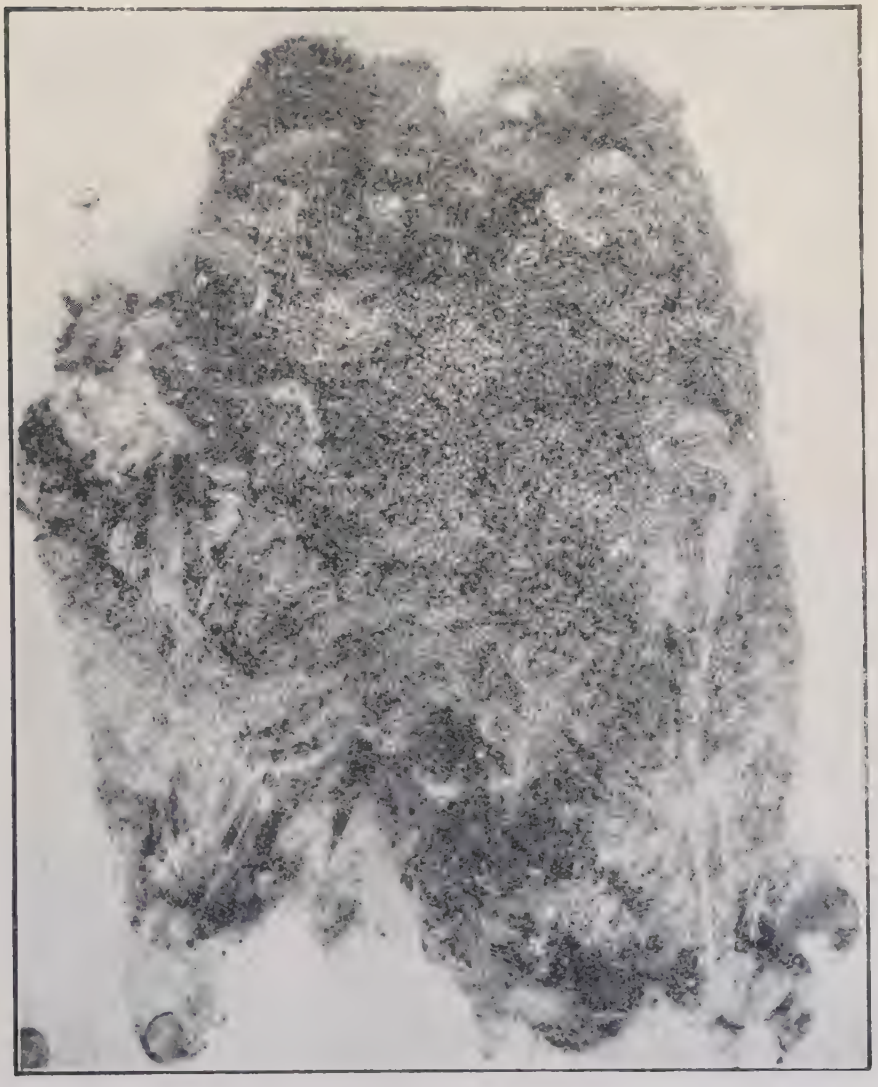
This insect has been discovered during the last year or two infesting sheep in several districts. As its name infers, it is found about the feet, fetlocks, and undersides of the legs towards the belly. It differs entirely from the previously described louse in size, shape, and mouth parts.



Sheep Foot Louse, *Linognathus pedalis* (*Osborn*).
× 50 Male. × 50 Female.
(Original.)

Its mouth parts are adapted for piercing the skin and sucking the blood of the host animal. It follows, therefore, that should it become abundant upon an animal, the injury would be more severe than that caused by the biting lice which do not puncture the skin.

Fortunately, this pest is, so far as we know, confined to several isolated areas, whereas the biting louse is more or less widespread throughout the State. As far as I have been able to ascertain there does not appear to be any previous record of this insect in Australia. (*Haematopinus ovillus*) has been reported in New South Wales (see *Journal of Agriculture*, April, 1923). Judging, however, from the statement therein made that the eggs were found on the wool of the belly, legs, and thighs, I am of opinion that the louse then found is identical with the one herein recorded (*Linognathus pedalis*).



Portion of wool from fetlock of sheep, showing masses of louse eggs or "nits."
(Original.)

Description.—The foot louse has a short head, as wide as it is long, which merges into the thorax, mouth parts for piercing or sucking. There are no eyes apparent. The antennae large, five-jointed, pointed, terminal joint with three or four bristles. The body is about 1/12th of an inch long and 1/25th of an inch wide, being considerably longer and wider than the biting lice. The males are broader and flatter than females. The legs are strong and terminated with a powerful claw. Anterior or front pair smallest, posterior pair largest. The white eggs or "nits" are attached to the wool on lower part of leg and foot, a short distance from the skin. They take slightly longer to hatch, but otherwise the life history is very similar to the sheep louse.

There are other lice infesting our pigs, horses, etc., but the purpose of this article is to deal only with those species infesting sheep.

The Sheep Tick—Female.
Melophagus ovinus (*Linn*).
× 13. (Original.)

THE SHEEP TICK.

(*Melophagus ovinus*, Linn.)

This so-called tick is not a true tick, but is a wingless parasitic fly which passes the whole of its life stages on the body of the sheep. There are various vernacular names attached to this insect, namely, "Ked," "Louse Fly,"

and "Sheep Tick." It is a blood-sucking insect that is now widespread in many sheep-producing countries, and is certainly well established and widespread throughout the flocks of this State.

This wingless fly belongs to the great Order of *Diptera, Family Hippoboscidae, Genus Melophagus.* This insect is curious in that it does not lay eggs as do most *Diptera* or flies. The egg is retained within the body of the mother, hatches therein, the larva becoming full grown. It is then given birth to, enveloped in a soft membrane, which quickly hardens into a shell around the larva, forming what is called a puparium wherein it pupates. The larval stage of this fly does no harm whatever, the blood-sucking habit of the adult being the cause of all the trouble. The pupa is attached to the wool by a glue-like substance. These shell-like pupæ are in error called eggs.

Pupa of Sheep Tick, in error called the egg.

In from 20 to 25 days after being deposited the pupa is broken open by the tick, which emerges and becomes at once an active blood sucker. Four to six days later it reaches sexual maturity, and 10 to 12 days later the female deposits her first pupa. Each female is capable of depositing several pupæ. We therefore have the following life cycle egg and larval stage within the mother seven to 10 days, from birth of larva enveloped in soft pupa case to emergence of tick 20 to 25 days, in 12 to 14 days after emerging from the pupa the female is depositing her first pupa. The life cycle is completed every 39 to 49 days.

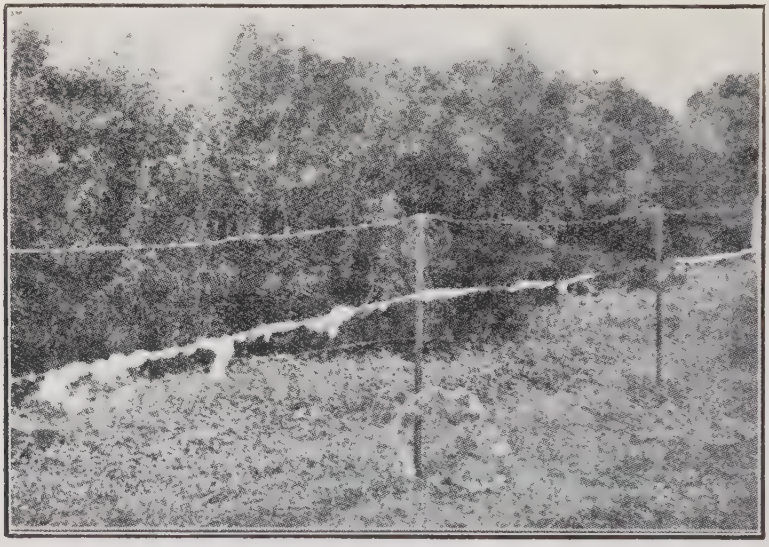
In treatment, therefore, it is necessary to repeat the dipping 20 to 25 days later, thus destroying any ticks that may have emerged from pupæ which resisted the first treatment.

Description.—As before stated, this insect is not a true tick, but is a wingless fly. It has six legs, whereas the true ticks have eight when adult. The mouth parts are very similar to those of other blood-sucking flies. The legs are fairly long, strong, and terminated with two powerful long claws. The antennae are unobservable. Upon the head may be seen a pair of stout stylets, the piercing mouth structures, which are tipped with several strong hairs. The adult is about a quarter of an inch long, of a reddish or grey-brown colour. The body is distinctly divided into head, thorax, and abdomen, which again distinguishes them from the true ticks, which have the thorax and abdomen fused, with a very inconspicuous head. The fore part of the body is uncommonly small. The abdomen is, however, proportionately very large, especially when the insect is well gorged with the blood of its host or is carrying a well-developed pupa. They have a rapid motion when disturbed, running rapidly forward or sideways and backwards like a crab. The neck, breast, shoulders, belly, and thighs are the favoured locations on the host.

Injury.—This parasite, like the blood-sucking lice, lives upon the blood of sheep, which it obtains by sinking its sucking tube into the flesh.

When numerous they cause great irritation, loss of blood, interference with feeding, with consequent loss of condition and vitality. The sheep, when brought to this condition, are then unable to resist other diseases. The wool is lowered in value owing to its being soiled with the excreta and matted together with the pupæ. The sheep also scratch, bite, and rub themselves, causing the fleece to become ragged and broken in staple. The lambs of the flock suffer most from the ravages of this pest, and, if they become heavily infested, receive a set-back at an important period in their development.

How the pest is spread.—Although this insect does not seem to possess the instinct of migration to any extent and cannot fly, nevertheless, once introduced into a flock it soons spreads. This is particularly so where sheep are frequently herded or yarded. When in contact with each other the tick readily passes from one animal to another. There are other means of spreading, such as on dogs or other animals which have come in close contact with



Infested wool clinging to wire fence afer sheep have been scratching.

infested sheep. Men working amongst infested sheep sometimes carry the parasite on their clothing, and may thus be the means of introducing them into a clean flock. Scratching posts, fences, wires, trees, etc., against which the sheep have rubbed and dislodged some infested wool may be the medium of conveying the pest to a clean sheep should same come in contact. If tick is suspected, part the wool over the neck, breast, shoulders, belly, and thighs, when they will be readily detected (Fig. 5).

In the interests of the sheep and wool industry, it behoves all owners to make themselves acquainted with these external parasites, so that they can recognise these pests in their initial stages of introduction to the flock. The next step is to take prompt and correct measures for their treatment, and if possible, eradication.

Wool on neck of infested sheep parted, showing ticks and pupae.

THE SHEEP LOUSE.

Hugh McCallum,
Sheep and Wool Inspector.

ECONOMIC ASPECT.

Owing to the ravages of the external parasites which are infesting our flocks, namely, lice and tick, our wool, and also the carcase, has suffered considerable depreciation. In these times of great demand for wool and sheep at high prices, we cannot afford to temporise with these parasites. The sheep farmer must come to a realisation of the fact that unless he makes a determined effort to eradicate or control these pests, they will sooner or later reduce his sheep and wool to such a state that they will prove unprofitable.

Many of our local clips have held their own with the best of Australia. It has always been noted that the highest values obtained for sheep or wool have been from those sheep that had the necessary care and attention. The owners of these high-priced wools have shown a careful and intelligent interest in their sheep. The stations or farms have been equipped with facilities for dipping, draining yards, etc.

The prevention of this ever-increasing loss is not a matter of difficulty. The initial outlay in providing the dips and other facilities is soon offset by freeing the sheep of the parasites and the consequent heavier fleece and carcase, which means enhanced prices. It is a great and common mistake of many farmers to neglect these provisions on the grounds that they cannot afford the outlay. "A stitch in time saves nine" is a very true saying, and is very applicable when dealing with lice and tick. A pound spent in prevention or treatment means the saving of many pounds later on.

Sheep that are infested with these parasites give birth to weakly lambs. These in turn become infested, and their development is greatly retarded; thus again is the farmer the loser.

Wool freed from tick and lice is bright, clean, and attractive contrasted with that produced by infested sheep, which is of much inferior quality. It is difficult to estimate the actual financial loss which follows neglect, but sufficient is it to state that it runs into many thousands of pounds per annum.

There is another aspect of the case which is a serious one, namely, the infestation of clean sheep by the yarding of infested sheep in public or private saleyards. These yards become infested and clean flocks which are being offered for sale pick up these lice or ticks. This often means that the buyers unknowingly take infested sheep on to their property, and thus introduce the pest into otherwise clean areas.

Some difficulty may be experienced by farmers in recognising these pests, but it is hoped that a reference to the notes provided in this article by the Entomologist will assist in this respect.

It is the hope of this Department that before many years all farmers will be the possessors of sheep, which are a necessary adjunct to successful farming—hence the reason for all concerned being made acquainted with the need for taking all precautions against the introduction of these pests and making themselves acquainted with the methods of prevention and treatment.

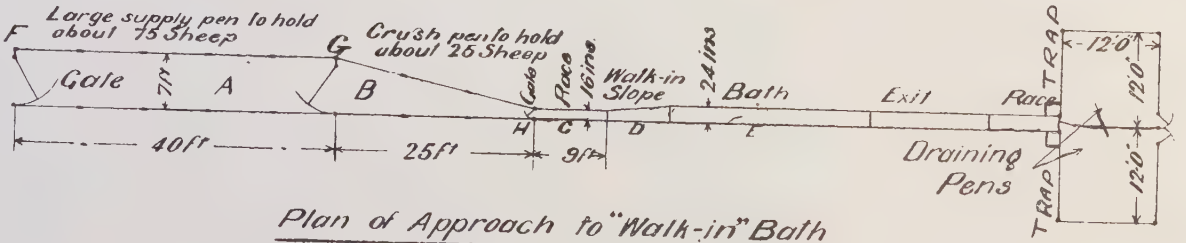
Sheep Parasites and the Dip.—When sheep are infested it is necessary that a dipping mixture be applied to destroy the parasites. Sheep are often rushed through the bath, with the result that the dip does not reach the skin, and consequently the pests remain more or less unaffected by the treatment. The dip must penetrate to the skin, not only to destroy the existing parasites, but to protect the animal against becoming re-infested. It is imperative that all owners realise the importance of this and discontinue the habit of

A modern Sheep Dip.

rushing the sheep through the dip. Regular dipping is essential, and the instructions issued regarding this must be strictly carried out. Each animal put through the dip requires to be soaked for not less than a minute. Sheep should be dipped from four to six weeks after shearing.

To make a complete success of dipping it may be necessary to repeat the operation some 20 to 25 days later. This, as the Entomologist points out,

"Walk-in" Entrance Suitable for any Long Swim Bath



Plan of Approach to "Walk-in" Bath

Section of Bath with "Walk-in" Entrance

is owing to the failure of the first dip to destroy eggs or pupæ, which are very resistant stages.

Care before and after Dipping.—Adverse climatic conditions at the time of dipping can, and do, have a detrimental effect on the result. They are, however, beyond our control, but by using a dip of unvarying and guaranteed constancy and following the instructions, good results will be obtained. The care and condition of sheep before and after dipping are matters which should not be overlooked.

Sheep should not be dipped during extremes of heat or cold, when thirsty, or in a heated state from driving. When ewes and sucking lambs have been dipped the lambs should be kept apart for a time.

In districts where each farmer cannot afford to put in a separate dip, the matter of installing one on the co-operative system should meet with general support. This can be erected at little cost by the interested parties.

For the information of farmers a diagrammatic plan of an effective sheep-dipping tank has been prepared, and is submitted herewith.

The particulars regarding the materials used in the preparation of the dipping fluid will be found in "The Eradication of Lice and Tick in Sheep," by Mr. Murray-Jones, the Chief Veterinary Officer.

EXPLANATION OF DIAGRAM.

Sheep-dip—"Walk in" Entrance. (See plan.)

A and *B* are supply and crush pens, which are fed from the usual sheep yards, with which the former should be connected. The latter should have a battened floor, the battens being made in sections, so that they can be removed after dipping.

C race, nine feet in length, 16 inches wide, sufficient to hold four sheep. This race should have a battened floor, to be removed after dipping.

D represents the "walk-in" section, and is an incline nine or 10 feet in length (10 feet is better), gradient one in two, ending in a drop of 12 inches above the bottom of the bath. Its width at the point at which it connects with the race is the same as that of the race itself, namely, 16 inches; hence it gradually widens to 24 inches, to connect with the bath at the other end, of which it practically forms a part. The sides of the "walk-in" section are also, in all respects, identical with those of the bath.

E, portion of the swim bath.

F, G, H, represent gates; *F* and *G* are 4 to 4½ feet gates hung on posts 3 feet or 2½ feet from the side fence, so that when open they will close up the angles and form a "lead in." *H* is a small gate to close the four sheep in the race.

Two draining pens, each 12 by 12, are necessary, and a shed could be erected over same if required.

The size of the above dip can be reduced to meet the requirements of the small stock owner. A dip from 15 feet to 25 feet long is large enough for a small flock.

ERADICATION OF LICE AND TICK IN SHEEP.

F. Murray-Jones, B.V.Sc., M.R.C.V.S.,
Chief Veterinary Officer.

The attention of pastoralists, farmers, and stockowners generally cannot be too forcefully directed to the immediate necessity for using every means within their power in adopting suggestions set out in this article for their guidance in eradicating both lice and tick from their flocks. It is a serious reflection on the part of those persons concerned in the management of their flocks to allow lice or tick to continue to infest their sheep. To advance the plea that they were unaware of their existence shows that insufficient care is being exercised in their supervision. On the other hand, to be aware of the existence of these parasites and fail to adopt remedial measures, is even more culpable. It is pointed out that to travel, or expose for sale in a public place, sheep which are infested with tick or lice becomes an indictable offence for which penalties are provided under "The Stock Diseases Act, 1895."

At the present time there is undoubtable evidence of the unsatisfactory state of many of our flocks, and in some parts of the State the parasites have spread with such rapidity that within 12 months infestation has increased 100 per cent. In one of our chief markets (Midland Junction Saleyards) a large number of cases have been noted by inspectors of this Department of the presence of both lice and tick, and if this state of affairs is allowed to continue it must eventually react to the disadvantage of the State's sheep industry as a whole, and further, a serious monetary loss is sustained through deterioration in the marketable quality of our wool. Lice and tick in sheep, if allowed to continue, must eventually go from bad to worse, therefore all persons concerned should realise the position and determine on the right lines to stamp the trouble out.

Remedy.—In order that a remedy may be effected, it is first necessary to obtain evidence by examination as to the existence or otherwise of lice or tick in your sheep. In order to do this the sheep should be seized and placed in a sitting position between the feet of the operator with the back of the animal resting against the legs. Special attention should then be paid to the unexposed portion of the body between the chest and the forearms—on the belly, beneath the jaw and the under portions of the neck. Afterwards the back and flanks should be examined.

A full description of both the sheep louse and the sheep tick and how to identify is supplied in this article by Mr. L. J. Newman, Economic Entomologist. (See page 99.)

Dips and Dipping.—The class of dip used depends upon the number of sheep required to be dipped. For general requirements one cannot do better than adopt the type recommended by the Departmental Sheep and Wool Expert (Mr. McCallum), particulars of which have been previously published but which are reproduced in this article. This can be modified to suit requirements peculiar to the owner.

The best time to dip is one month off shears for short wools, and six weeks for long wool varieties. However, in some parts of the State one recog-

nises the difficulty of a second muster, and in those cases dipping off shears is the only alternative. When this is the case every care should be taken to see that the animals are effectively dipped—preferably in a swim dip.

The advantage of dipping with a month's wool on is obvious, as it affords an opportunity for the solution to take hold, and in consequence the efficiency of the operation is enhanced. Care should be taken not to dip sheep when hot after travelling or when thirsty. Thin sheep require more gentle handling than strong vigorous ones. When dipping off shears it is always advisable to dress shear cuts with a dab of antiseptic dressing, supplied by dip manufacturers, before immersing.

Kinds of Dip to use.—There are many makes of dip on the market, but the only kind recommended by this Department is one containing one-tenth per cent. of arsenious oxide. This class of dip has been proved throughout the Commonwealth to be the most efficacious, and, in consequence, the cheapest in the long run.

Lime and sulphur dips should be avoided except in cases of scab. Lime has a detrimental effect, as it causes the fleece to become hard and harsh in texture, stunted in growth, and a bad colour. From a manufacturing standpoint these are most objectionable, causing dyeing faults and, ultimately, indifferent fabrics.

Lime renders fibre brittle, stunts growth, destroys elasticity, causes difficulty in scouring, spoils it for taking dyes, and, finally, can only produce low grade fabrics.

Tobacco dips are objectionable, as wool from sheep so dipped is not suitable for making even ordinary fabrics, and, further, has been proved absolutely useless in regard to the destruction of lice and tick.

Carbolic and alkali dips are not recommended, for the reasons set out in connection with tobacco dips.

The only point to remember in connection with the use of the prescribed arsenical dip is to carefully execute the directions issued by the manufacturers given on packet or container.

The dip should be tested from time to time, so as to ascertain the right strength is being maintained.

A PURE BRED BULL'S ARITHMETIC.

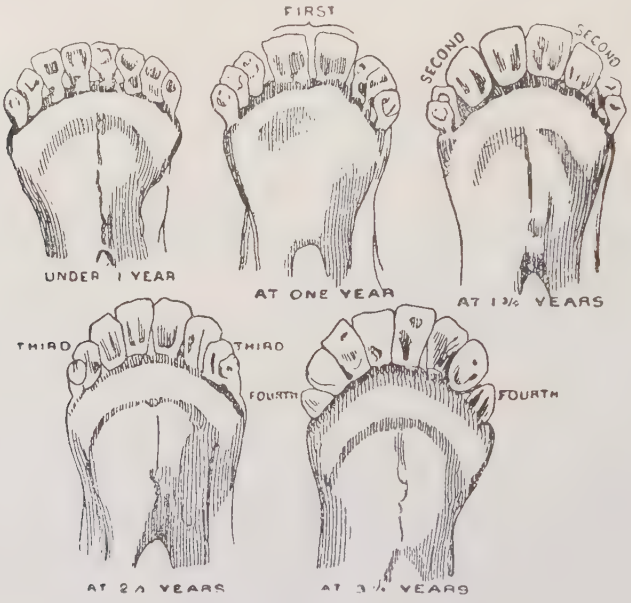
"I am not strong on arithmetic" said the pure-bred bull, "but I can add to the bank account of the man who owns me; I can subtract from the principal of his mortgage; I can multiply his chances for success; I can divide his cares and worries; I can give more interest to his work; and I can discount his chances for loss."—*Live Stock Bulletin.*

DENTITION OF SHEEP.

Hugh McCallum,
Sheep and Wool Inspector.

A most important matter in the keeping of sheep is that of judging the age of the animals. From the number of inquiries received at sheep demonstrations, a description of the sheep's mouth from birth to maturity will be useful to those whose knowledge of sheep is small.

Sheep have thirty-two teeth, as follows:—Incisors, eight, which are situated in the front of the lower jaw, by which the age of the sheep is reckoned, and molars or grinders, six each side on both jaws. At birth a lamb possesses two temporary central incisors, and at the end of four weeks all the tem-

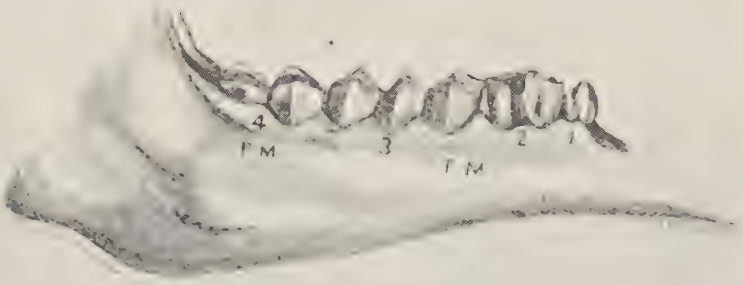


Dentition—Incisors.

porary incisors (eight) are up with the three molars in each of the upper and lower jaws (first, second, and third temporary molars). At three months the fourth molar is cut, and is permanent. Ninth month another molar (the fifth) is to be seen. At eighteen months the sixth permanent molar is cut. The third temporary molar covers the top of the permanent molar, while the first and second permanent molars push off the temporary ones. Thus a sheep has all its permanent molars at from eighteen months to two years old.

The molar teeth are used for masticating the food, their surfaces being irregular and suitable for grinding.

With the incisors, the first two or central permanent teeth make their appearance at from twelve months in early to fifteen months in late dentition.



1.

2.

3.

Dentition—Molars.

The sheep is then known as a "two-tooth" or "hogget." At two years of age the two teeth on either side of the central teeth are replaced by two permanent teeth. The sheep then becomes a "four-tooth." At three years of age two more permanent teeth make their appearance, and the sheep is then described as a "six-tooth." At four years of age two more permanent teeth appear, and it is then an "eight-toothed" or "full-mouthed" sheep.

From this onwards the age of sheep cannot correctly be determined by the teeth. From about five years of age the central teeth will show signs of separating in the middle, and as the sheep becomes older the other teeth will separate, and may be broken. With age the teeth become worn down or lost, and the sheep is then known as "broken mouthed." Sheep have been known to retain good teeth until an old age. The wear of the teeth all depends upon the class of country, the early or late maturity of the breed, and whether the mouth is defective or otherwise.

In the case of broken teeth it is wise if only three or four or fewer teeth are left to pull them out and leave the animal "gummy." Sheep cannot bite with odd or gapped teeth as well as they can with gums. The best advice is not to pasture or purchase old sheep if younger ones are procurable. Indications of old age are sagging of the loins, distended nostrils. and deterioration of the fleece in quality and quantity.

FARMERS' FIELD TRIALS.

H. RUDALL,
Field Officer.

Farmers' field trials were again carried out last season, at various centres, with wheat, oats, rate of seeding, rate of super and mixed fertilisers, and the results obtained are worthy of attention. The areas of the plots were .45 to .5 of an acre, all duplicated.

WHEAT TRIALS.

The wheat trials were carried out at Gutha, Bencubbin, Narembeen, and Dalwallinu, with early and very early varieties. Merredin and S.H.J. were compared with the two old standard varieties Gluyas Early and Florence. Only at one centre (Bencubbin) was a control or check plot used, namely, Canberra, comparing with Gluyas Early and Merredin.

At three centres only (Gutha, Carnamah, and Dalwallinu) were the early and very early variety trials carried out. Two sowings were made so that the very early maturing varieties could be sown seasonably during the latter portion of the sowing season. A comparison of the individual computed yields per acre of the different varieties can be made from the following table:—

Farmer.	District.	Type of Soil.	Florence	Gluyas Early.	Merredin	S.H.J.	Control Plots.	
							Yield.	Variety.
			bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	
R. Bicket...	Dalwallinu	Red loam ...	13 13	13 10	15 57	12 19	...	
W. J. Eva	Gutha ...	Light, fluffy yellowish	10 32	16 18	19 3	10 29	...	
B. W. Hopwood	Bencubbin	Light red friable loam	...	21 31	23 23	...	20 22	Canberra.
F. Noble...	Narembeen	Red clay loam...	...	16 26	17 10	...	...	

OFFICIAL RAINFALL, 1924, AT OR NEAR EACH CENTRE.

District.	Jan.	Feb.	Mar.	April	Useful rains.							o.	Dec.	Total.
					May.	June.	July.	Aug.	Sept.	Oct.	Total useful rain.			
Bencubbin (Mt. Marshall)	...	119	54	23	155	160	124	220	62	162	883	44	...	1,123
Carnamah ...	...	...	...	13	95	264	371	222	61	126	1,139	62	...	1,214
Dalwallinu ...	...	...	28	11	123	256	263	198	89	142	1,071	44	...	1,154
Isseka	...	...	52	6	161	431	335	325	133	174	1,559	52	2	1,671
Tenindewa (Mullewa)	...	1	46	...	92	347	198	172	60	135	1,004	23	...	1,074
Gutha	...	...	136	2	90	282	309	198	46	111	1,036	33	50	1,257
Narembeen (Emu Hill)	...	54	8	34	287	188	102	174	98	146	995	29	7	1,127

The 1924 season cannot be regarded as a favourable one from an average rainfall standpoint, the rainfall being low during the wet months of the year—May, June, and July. The falls were sufficient to ensure good germination and carry the growth forward, but not enough to maintain a storage for the latter part of the season, and the effect of this was very marked during the low rainfall in September whilst the flowering period took place.

Plot of Merredin at Gutha (Mr. W. J. Eva's).

Field Day at Bencubbin Plots. (Mr. Hopwood's).

Where the land was early and well fallowed, this shortage, owing to moisture conserved, was not so marked. The want of moisture caused a good many shoots to die off; and later, when the heads were formed, instead of the spikelets carrying three or more grains, the centre flowers did not set at all, and the majority of spikelets carried only two grains. With the beneficial falls above the average during October, and light showers with low temperatures in November, a great recovery was realised, especially by those who gave due consideration to the careful preparation of the fallow and did not rely upon the amount of rain on the crop.

CULTURAL NOTES.

Gutha (W. J. Eva).—Variety trials, mixed fertiliser trials. Ploughed July, 1923; cultivated September, 1923, April, 1924; sown 8th and 26th May with 45lbs. seed and 100lbs. super per acre.

Bencubbin (B. W. G. Hopwood).—Variety trial, rate of seeding and rate of super trials. Ploughed July, 1923; cultivated with springtyne September; sundercut October and November; springtyne prior to seeding, 1924; sown 14th May, variety trial with 45lbs. seed and 100lbs. super.

Tenindewa (R. A. Oldham).—Rate of super. Ploughed July, 1923; harrowed in spring; cultivated in May, 1924; sown 7th May with 45lbs. seed, Nabawa variety.

Narembeen (F. Nobles).—Variety trial, rate of seed and rate of super trial. Ploughed late in August, 1923, with moulboard; springtyned about middle of September, again in October, 1923, and prior to seeding 1924; sown 21st and 22nd May; variety trial with 45lbs. seed and 75lbs. super.

Carnamah (J. Laing).—Mixed fertiliser. Ploughed July, 1923, and cross-ploughed later; cultivated September, 1923, April, 1924, harrowed twice in May; sown 24th May with 45lbs. seed, Nabawa variety.

Dalwallinu (R. Bicket).—Variety trial. Ploughed July, 1923; cultivated September and October, 1923, with tandem disc and again in April, 1924; plots for very early varieties cultivated again in May; sown 12th and 28th May, 1924, with 45lbs. per acre and 100lbs. super.

RATE OF SEEDING.

F. NOBLES, NAREMBEEN.

Nabawa Variety.

Rate of Seed.	Type of Soil.	Cost.	Yield.	Increase yield.	Decrease yield.	Cost increase of yield.	Cost decrease yield.
		s. d.	bus. lbs.	lbs.	lbs.	s. d	s. d.
45	Scrub plain light colour interspersed freely with gravel	3 5	13 37	...	...	...	...
60		4 7	14 7	30	...	1 2	...
90		6 10	13 3	...	34	...	3 5

B. W. HOPWOOD, BENCUBBIN.

Nabawa Variety.

45	Light red friable loam	3 5	21 11	...	...	...	...
60		4 7	21 8	...	3	...	1 2
90		6 10	19 42	...	90	...	3 5

These results support last year's trials, showing that in early districts there is no advantage in using more than 45lbs. to 50lbs. of clean seed per acre.

RATES OF SUPER TRIALS.

B. W. HOPWOOD, BENCUBBIN.

Rate of Super per acre.	Type of Soil.	Cost.	Yield.	Increase of yield.	Cost of increase.
lbs.		s. d.	bus. lbs.	bus. lbs.	s. d.
75	Light red friable loam ...	4 0	21 28	...	...
150		8 0	22 38	1 10	4 0
225		12 0	22 30	1 2	8 0

F. NOBLES, NAREMBEEN.

75	Scrub plain light colour interspersed freely with gravel	4 0	9 52	...	...
150		8 0	12 14	2 22	4 0
225		12 0	10 53	1 1	8 0

R. A. OLDHAM, TENINDEWA.

80	Medium red loam	4 3	23 13	...	...
140		7 5	25 48	2 35	3 2
206		10 11	25 57	2 44	6 8

The reduced yield at Narembeen compared with Tenindewa and Bencubbin is due to the poorer quality of the soil, also the uncertain opening of the season, as during an inspection in September these plots appeared thin, probably due to a proportion of seed having malted.

FERTILISER TRIALS.

W. J. EVA, GUTHA.

Fertiliser.	Computed Yield per acre.	Cost per acre.	Yield.		Cost.	
			Increase.	Decrease.	Increase.	Decrease.
	bus. lbs.	s. d.	bus. lbs.	bus. lbs.	s. d.	s. d.
100 Super	18 58	5 4	...	...	...	...
100lbs. Super., 50lbs. Ammonia	21 14	14 4	2 16	...	9 0	...
100lbs. Super., 25lbs. Ammonia	19 39	9 10	0 41	...	4 6	...
100lbs. Super., 25lbs. Potash ...	19 18	8 10	0 20	...	3 6	...

Soil—Light and a little fluffy, yellowish in colour.

J. LAING, CARNAMAH.

80lbs. Super.	14 4	4 3	...	...	...	...
80lbs. Super., 20lbs. Ammonia ...	11 37½	7 10	...	1 13	...	6 4½
80lbs. Super., 20lbs. Potash ...	14 0	7 0½	...	0 4	...	2 9½
80lbs. Super., 20lbs. Ammonia, 20lbs. Potash	12 51	10 7½	...	1 13	...	6 4½

Soil—Scrub plain very light, yellowish in colour.

The plots at Mr. Laing's were on slightly inferior soil than those at Mr. Eva's, also at one end about three chains long the growth of each plot was affected by the soil having previously grown low wodgil. A perusal of each trial, however, indicates the efficacy of superphosphate.

FARM IRRIGATION.

A. R. C. Clifton,
Officer in Charge of Irirgation.

Irrigation is the artificial application of water to the soil, enabling successful crops to be grown which otherwise would not be possible owing to insufficient or irregular rainfall. It is mainly practised in arid and semi-arid climates, but is also resorted to in a lesser degree under humid conditions.

The terms arid, semi-arid, or sub-humid, and humid do not refer to the quality of the soil, but are used in classifying areas purely with reference to the annual precipitation. A district with an annual rainfall of under 10in. is termed arid, from 10in. to 20in. semi-arid or sub-humid, and over 20in. humid. A study of the rainfall map of Western Australia discloses the fact that according to the above classification of rainfall zones, seven-eighths of the whole area of the State is arid or semi-arid. There is, however, a certain diversity of opinion regarding the amount of rainfall which determines these three zones, so from an irrigation point of view we may refer as arid to those areas where the whole of the crop is produced by moisture supplied by irrigation; semi-arid or sub-humid those areas where crops are produced partly by the natural rainfall and partly by irrigation, and humid when the whole of the crop can be produced by the natural rainfall, except in dry years.

Practically the whole of the irrigation in this State at the present time is being carried out in the humid South-West. The reason for this is not because irrigation is more necessary or the land more fertile than other portions of the State, but because in this district permanent streams and suitable sites for storing the winter floods by means of dams and reservoirs exist.

Our North-West rivers offer opportunities for irrigation and closer settlement, but these propositions are primarily engineering problems, as the flow of the rivers is intermittent, and storage is necessary before irrigation on a large scale is possible. The time is not far distant, however, when probably the major area under irrigation will be in the arid and semi-arid districts of these Northern rivers.

Practically all the rainfall in the South-West, ranging from 25in. to 50in., falls during the six winter months, and very often arid conditions exist during the summer. It is usually contended that if crops could be irrigated during these summer months the results would more than pay for the cost of irrigation, and this contention has been borne out in many cases.

The installation of an irrigation plant in a humid district should be regarded as an insurance against a dry season, although once the plant is installed it would be very seldom that an application of water would not increase the yield of summer crops. The question is, however, not whether irrigation would increase the yield, but rather, whether the increased yield would warrant the cost, or whether good results could not be obtained, and much more cheaply, by adopting better cultural methods.

Professor S. W. Fletcher in his book, "Soils," points out that "as a general proposition, irrigation under humid conditions is a matter of expediency: it may or may not pay according to the conditions: it is an entirely different

question here from what it is in arid regions; there irrigation is the only way to make farming pay." He goes on to say that irrigation in a humid climate may easily become a cloak for shiftless tillage. This applies to some localities in our South-West, as there are occasions where improved farming methods would to some extent overcome the difficulty.

In our dry areas we find that fallowing and cultivation husbands the natural moisture sufficiently to enable the successful growing of wheat with a 10in. rainfall, and it is a recognised fact that the thorough cultivation of deep soils enables portion of one season's rainfall to be carried on to the next. The quantity so retained depends on the depth and nature of the soil. Deep soils then are most important in both dry and irrigation farming.

The soils of humid areas, however, are not usually so deep or fertile as those of arid, and crops growing on shallow soil feel the effects of hot dry spells if only of short duration, consequently light waterings at frequent intervals are advisable when irrigation is practised under humid conditions and drainage is necessary and must also be provided.

A large part of the moisture received by the soil is lost through evaporation and drainage, and only portion of that remaining is available for plant growth. The amount of water required and frequency of application varies with the kind of crop and its stage of growth, and is also influenced by the soil and climatic conditions. Evaporation is high in soils exposed to hot dry winds, and low in sheltered positions where the air is moist. It will be less in deep soils than in shallow or those which tend to crack after irrigation. It is therefore necessary to check this loss by keeping the surface of the soil stirred by cultivation. This is of primary importance when irrigation is practised, and should be done as soon as practicable after watering.

The whole question of irrigation must be viewed from the standpoint of whether it will pay, and this can only be determined when the cost and value not only of the whole, but of the individual parts are known. The annual cost will be—(a) the actual cash outlay for operation, (b) interest on investment in plant and preparation of the land, (c) and depreciation. These can be estimated after taking into consideration the water supply and height it has to be lifted, the area, contour of the land, and kind of crop to be irrigated, class of soil, and climatic conditions. The foregoing considerations also determine which of the many methods of distributing the water will be most suitable. The difference between the value of the increased yield, due to irriyation, and the cost of irrigation, including any extra farm operations in connection therewith, will be the value.

It is proposed to elaborate on the foregoing in a series of illustrated articles in later issues of this *Journal*, and as the Departmental Bulletin No. 41, "Irrigation and Drainage," by Mr. A. H. Scott, late Irrigation Expert, which dealt with the different methods of applying water to the land, is out of print, this will be largely incorporated.

ROYAL WHEAT CROP COMPETITIONS—ZONE CHAMPIONSHIPS.

Geo. L. Sutton, Director.

Crop competitions in this State were inaugurated by the Royal Agricultural Society in 1921, when for the purpose of these competitions the Wheat Belt was divided into five zones named, respectively, North Coastal, North-Eastern, Central, South-Eastern, and Southern Zones.

In each of these zones two prizes, valued respectively at £15 and £5, were offered for the best 50 acres of crop of any one variety, which should be judged according to a specified scale of points.

In the following year a few district societies also held competitions, and the next year, 1923, in order to stimulate more interest in this progressive movement and encourage additional societies to hold competitions, the Royal Agricultural Society made a change in the method of entry for the Royal Competition.

Originally the entry was made direct to the Royal Agricultural Society, but, under the new scheme, it was provided that entry in a local district competition also entitled the competitor to compete for the Royal Championship honours, the competitors for these being selected from the first and second prize winners in the district competitions. Experience proved that this plan had one serious disadvantage, in that many good farmers were debarred from competing because their local agricultural societies did not hold crop competitions. This was remedied last year by arranging that competitors so placed should enter directly through the Royal Agricultural Society; at the same time the scale of points was altered slightly. The amended scale is shown hereunder with the original points in parentheses:—

(a) Estimated yield, having regard to the average yields of the district in which the farm is located—35 (30) points.

(b) Free from weeds—25 (30) points; with penalties as follow:—new land—6 (4) points; second crop—4 (3) points; third crop—2 (2) points; fourth crop—1 (1) point.

(c) Freedom from admixture—15 (20) points.

(d) Evenness of growth—10 (10) points.

(e) Freedom from disease, smut, take-all, etc.—15 (10) points.

Total—100 points.

This year the number of zones has been reduced from five to three, which roughly coincide with the rainfall areas, thus:—

Early Zone, or Zone No. 1: With rainfall not exceeding 15 inches.

Mid-season Zone, or Zone No. 2: With rainfall over 15 inches and not exceeding 20 inches.

Late Zone, or Zone No. 3: With rainfall over 20 inches.

ROYAL CROP COMPETITION.

Prize winning crop, Zone 3. Variety, Federation.

ROYAL CROP COMPETITION.

Prize winning crop, Zone 3. Variety, Federation.

That the aims of the Royal Agricultural Society for stimulating interest in this movement have been achieved is shown by the number of societies, and also by the number of competitors who interest themselves in this phase of agricultural progress.

The number of competitors and districts represented since these competitions were initiated is as hereunder:—

	1921.	1922.	1923.	1924.
Number of District	...	...	12	15
Number of Competitors	15	32	82	70

The judging of the Royal Crop Competition is done by departmental officers attached to the Wheat Branch, who are also in great demand as judges of the district competitions. This year the judges were Messrs. I. Thomas, J. Langfield, H. Rudall, and W. P. Cass-Smith.

Under the West Australian system of judging the yield is not estimated, but is calculated from the yield of the crop on a number of small areas taken systematically throughout the competition crop, and the grain of which is threshed out.

As far as is known this plan is not practised elsewhere in connection with the judging of wheat crop competitions. Results have shown that the calculated yields so obtained closely approximate the actual yields harvested by the farmer. This plan is believed to be more reliable, and is certainly more satisfactory to farmers, than the allotment of points for yield in accordance with an estimate made by the judge. It, however, has the disadvantage that it limits the time available for judging, and, in consequence, owing to the limited number of judges and the demand for their services, their work during the judging season is particularly strenuous.

Including the districts entering directly through the Royal Agricultural Society there are—

In Zone No. 1, seven districts, viz., Bruce Rock, Dowerin, Tammin, Kellerberrin, Doodlakine, Baandee, Merredin, and Nungarin.

In Zone No. 2, seven districts, viz., Kulin, Beverley, Calcara, Marchagee, Pithara, Three Springs, sand Wongan Hills.

In Zone No. 3, one district, viz., Goomalling.

Fortunately, owing to the West Australian method of calculating yields and the uniformity of methods in the judging of the district competitions, the points allotted in the district competition can be and are, utilised for the championship awards.

The points awarded by the judges in the different zones are as hereunder:—

ROYAL WHEAT CROP COMPETITIONS.

ZONE CHAMPIONSHIPS.

Name and Address.	Variety.	Estimated Yield.	Freedom from Weeds.	Freedom from Disease.	Freedom from Admixture.	Evenness of Growth.	Total.
		Points awarded.					
	Zone 1.						
	Maximum Points ...	35	25	15	15	10	100
Hughes Bros, Minnivale ...	Nabawa ...	35	23	14	14	9	95
Lethlean, J., Bruce Rock ...	Nabawa ...	35	23	14	14	9	95
Hammond, J. D., Kellerberrin	Nabawa ...	34	23	13	14	9	93
McCarthy, P. & Son, Eujinyn	Nabawa ...	35	22	13	14	8	92
Cook, H. F., Tammin ...	Nabawa ...	33	24	13	13	9	92
Barton & Son, North Baandee	Gluyas L.	32	23	14	13	9	91
Hewton, A. W., Minnivale ...	Nabawa ...	33	23	13	13	9	91
Woolgar, W. G., Merredin ...	Nabawa ...	30	22	13	14	8	87
Creagh Bros., Nungarin ...	Gluyas E.	29	22	14	13	9	87
Teasdale Bros,. Merredin ...	Merredin ...	30	23	12	13	8	86
Murray, B. L., Doodlakine ...	Gluyas E.	35	18	13	12	8	86
Warner, F., Nungarin ...	Gluyas E.	28	20	14	13	8	83
Meakin & Son, Tammin ...	Nabawa ...	26	23	12	13	8	83
McLellan, J., Kellerberrin ...	Nabawa ...	24	20	13	12	8	77
	Zone 2.						
Ackland, R. B., Wongan Hills	Nabawa ...	35	23	14	13	8	93
McLean, J., County Peak, Beverley	Nabawa ...	35	20	13	14	8	90
James, L. & H., Kondinin ...	Nabawa ...	30	22	14	14	9	89
Hebiton, J. K., Three Springs	Gresley ...	31	23	13	12	9	88
Bowen, T., Wongan Hills ...	Federation	34	20	12	12	9	87
Trotter, H., Gnarming ...	Qn. Fan ...	28	23	13	13	8	85
Carter & Sons, Three Springs	Niloc ...	35	20	11	11	8	85
Lukin, G., Calcarra	Major ...	34	*18	12	12	9	85
Vanzetti, Mrs., Marchagee ...	Nabawa ...	23	21	13	13	6	76
Locke, J. H., Pithara ...	Nabawa ...	21	17	13	13	7	71
	Zone 3.						
Clifford, Michael, Gilliminning...	Federation	35	†20	13	13	8	89

* Deductions: 2 points, third crop.

† Including a deduction for second crop of 4 points.

Mr. Michael Clifford, of Gilliminning, was the only competitor in the late zone. His was an exceedingly fine crop of "Federation," well worthy of the honour it won, though without competition. The report of the judge, Mr. W. P. Cass-Smith, states:—"The crop was very tall and thick, the heads being well filled out. The land on which the crop was grown carried in the virgin state jam, wattle, manna, and white gum timber. It was ploughed in July with the mouldboard to a depth of five inches, cultivated after ploughing, and again, before seeding, with the springtyne cultivator. Sowing took place in May, 75lbs. and 120lbs. being the respective rates of seed and superphosphate.

It is to be sincerely regretted that there was so little competition in the third or late zone for, whilst wheat-growing may not be the prime importance it is in the other two zones, it has a place in the farm cropping and,

it is believed, a place which will increase in importance. Further, the very friendly and often keen rivalry brought about by these competitions, improves not only the methods connected with the production of wheat but also the farm practice generally. Because of this latter important factor, the question of changing the form of competition in this Zone will require to be considered if the lack of response to the present competition continues.

In the early and mid-season zones the response has been good, and there is very keen competition.

As provided by the conditions of the competition, all crops are on fallowed land, the methods adopted by the competitors for the ploughing and cultivation of this land being remarkably similar. There is a general tendency to carry out the initial operation early in the winter so as to ensure storage of all the winter rains possible, and in consequence the work of ploughing for the competition crops is invariably completed not later than July. One competitor, Messrs. P. McCarthy & Son, of Eujinyn (Bruce Rock), followed the Wimmera practice of summer fallowing, and carried out the initial operation in March. In only one instance was the depth ploughed less than four inches, the usual depth being between four and four and a-half inches.

In order to check the loss of stored moisture all the fallowed land was cultivated in early spring, followed by such subsequent cultivation as each competitor deemed necessary for the preparation of a good seed-bed. Having due regard to the rainfall and soil, the cultivation of the fallowed land by the different competitors is remarkably similar, in that the fallowed land is worked at least three times, that is, twice in the spring and immediately before seeding.

If the ground is not too hard and is fairly free from weeds, the ploughed land is usually first worked in September with a springtyne cultivator, but if hard or weedy it is turned back with a skim plough, disc cultivator, or "Sundercut." Following on the cultivation in September it is invariably cutlivated again in October with the springtyne and then left until the harvest, or in some cases, until planting time, when in most cases the ground is finally stirred with the cultivator or cultivator and drill combined. Several competitors also use the cultivator between harvest and sowing time in order to destroy weeds or break any crust formed by rain. Any slight variations in the procedure are due to a realisation of the fact that no hard and fast rule can be formulated as to how often the fallowed land must be worked. No good purpose is served by working the fallowed land unless for the destruction of weeds or to renew the soil mulch. The number of cultivations given must necessarily be governed by the character of the soil, the climatic conditions, and the weed growth. The object to be achieved is a seed bed free from weeds covered by a shallow mulch protecting a compact layer beneath from evaporation.

The popular variety is undoubtedly "Nabawa." In No. 1 Zone this variety was planted by nine competitors, including the winners. "Gluyas Early" was planted by three, and "Merredin" and "Gluyas Late" by one each. In No. 2 Zone there were five competitors, including the winners, who used "Nabawa" and "Federation;" "Gresley," "Queen Fan," "Niloc," and "Major" were used by one each.

There is not the same uniformity with regard to the rate of seeding as there is with regard to the preparation and cultivation of the fallowed land. In No. 1 Zone eight, including the winners, used 40 to 50 lbs., and six, 60 to 70 lbs. In No. 2 Zone one competitor used 45 to 50 lbs. seed, and the others used from 50 to 60 lbs. All competitors apply superphosphate at the time of sowing. The majority in both zones use from 70 to 90 lbs. In No. 1 Zone the winners used 110 and 90 lbs. respectively. In No. 2 Zone the winners used 60 lbs.

There is an undoubted tendency to plant later than was the custom some years ago, when the best month for planting was considered to be April. Only four competitors planted in this month, the majority of the remainder planted in May, and one competitor waited until June. May is, undoubtedly, the favourite month for seeding, and this preference is obviously well founded.

The competing crops were very free from disease, only traces of any being found. The presence of small patches of "take-all," however, in many of the crops in both zones is evidently a legacy of the "crop and fallow" period, and is the warning note now being sounded to change to the three-course system and to the introduction of oats into the cropping system in a regular and systematic manner.

The average yield of the 14 competing crops in the early zone was 32 bushels, and of the 10 entrants in the mid-season zone, 30½ bushels; the yields of the winning crops in each case exceeding 35 bushels. These yields must be regarded as extremely satisfactory, despite the fact that the season, though marred by a dry September, was undoubtedly good, and was crowned by unusually good rains after the middle of October. It was only possible for the competitors to derive full advantage of these late rains because of the good methods adopted, which enabled the crops to withstand the dry spell and carry on until the rains came.

The yields obtained are far beyond what were the expectations of the farmers in the early days of the settlement of these districts, and will prove a stimulating encouragement for the future.

Though the difference in the climatic conditions of different seasons makes comparisons difficult, it is interesting to note the variation in the average yield of the crops in this competition since its initiation. The average yields for the different years are:—1921, 25 bushels; 1922, 24 bushels; 1923, 29 bushels; 1924, 31 bushels.

There is distinct evidence that these competitions are bringing about uniformity of methods amongst the competitors, and largely following along the lines practised by the winners. The other farmers will follow the lead given by the competitors, and their methods must inevitably be improved. The undoubted effect of the Royal and district competitions will be, therefore, to standardise farming practice, and in the direction of better methods and higher yields.

FIELD EXPERIMENTS WITH WHEAT AT THE CHAPMAN EXPERIMENT FARM, 1924.

I. Thomas,

Superintendent of Wheat Farms.

The season experienced was an excellent one. The rainfall, though five inches less than the previous year, was in every way better, being more evenly distributed, and continued later in the season. The monthly details of the rainfall are shown below, together with those of the previous year.

	—				Growing Period.						Total.	—		Total for year
Year.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	In May-Oct.	Nov.	Dec.	Points.
1923	22	16	45	91	144	1,250	207	181	138	68	1,988	...	10	2,172
1924	...	1	115	15	173	418	292	296	158	156	1,493	53	3	1,680

From the above figures it will be seen that the heavier rainfall of 1923 was due to the excessive amount of 1,250, recorded in June, and which was injurious rather than beneficial. The good rains recorded throughout October this year were most beneficial.

The land on which the experiments were carried out was what may be classed as good second-class country, from which jam trees had been cleared some years previously.

All the experiments were planted on fallowed land. The initial ploughing was commenced in late June, and was completed early in August, 1923, and was afterwards cultivated with a 'Springtyne" implement when required to destroy weeds and conserve moisture.

In the soil-mulching experiment the cultivations given to the respective plots were in accordance with the requirements of the experiments. The other experiments were cultivated after ploughing again in October, in February or March, and finally prior to planting. Except the early section of the seasonable planting experiment which, in accordance with the requirements had to be sown in April, the planting of all the other experiments did not take place until after the autumn rains had set in on 11th May.

Rate of Seeding Experiment.—This was continued as in the previous years. Superphosphate was supplied at the rate of 150lbs. per acre. The results for this year and the average for the two years are as hereunder:—

RATE OF SEEDING EXPERIMENT, 1924.

Hay Yields.

Late Variety "Yandilla King," planted 15th May.

Rate of Seeding per acre.	Computed Yields per acre.			Average 1924.	Percentage 1924.	Average 1923.	Average 1923–24.	Percentage 1923–24.
	Section 1.	Section 2.	Section 3.					
	C. Q. L.	C. Q. L.	C. Q. L.	C. Q. L.	%	C. Q. L.	C. Q. L.	%
60lbs.	23 2 8	30 0 16	29 0 0	27 2 8	80	29 3 4	28 2 20	92
45lbs.	35 3 4	32 0 16	34 3 4	34 0 26	100	27 3 23	31 0 10	100
90lbs.	31 3 4	31 0 24	28 3 20	30 2 16	89	28 3 1	29 2 22	95
Early Variety "Florence," planted 17th May.								
60lbs.	25 0 8	23 3 4	27 0 24	25 1 12	94	15 0 27	20 1 6	100
45lbs.	27 1 12	24 2 0	28 2 8	26 3 6	100	13 3 7	20 1 7	100
90lbs.	30 0 0	29 1 12	30 2 8	29 3 29	112	18 3 1	24 1 13	120

Grain Yields.

Late Variety "Yandilla King," planted 15th May.

Rate of Seed per acre.	Computed yields per acre.					Average 1924.	Per-centage 1924.	Average 1923.	Average 1923–24.	Per-centage 1923–24.
	Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.					
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	bus. lbs.	bus. lbs.	%
60lbs. ...	18 48	16 40	13 28	14 40	13 36	15 26	92	28 48	22 7	98
45lbs. ...	18 8	16 56	15 12	16 32	16 32	16 40	100	28 19	22 29	100
90lbs. ...	17 12	17 4	16 0	14 24	14 16	15 47	94	27 33	21 40	96
Early Variety "Florence," planted 17th May.										
60lbs. ...	15 44	13 4	14 0	17 4	18 56	15 46	107	18 37	17 11	105
45lbs. ...	14 40	13 26	12 24	14 32	18 24	14 42	100	17 46	16 14	100
90lbs. ...	15 28	14 48	13 28	18 8	20 0	16 22	112	18 26	17 24	107

The results of the two years' experience indicate that, with a late free-stooling variety, there is no advantage in using more than 45lbs. of seed either for grain or hay. With an early sparse-stooling variety, however, heavier seeding is desirable for hay purposes.

RATE OF SUPERPHOSPHATE EXPERIMENT.

This experiment was commenced last year, three plots being seeded at 60lbs. per acre.

Table hereunder shows the results for this year, and the average for the two years:—

RATE OF SUPERPHOSPHATE EXPERIMENT, 1924.

Variety "Nabawa," planted 14th May, 1924.

HAY YIELDS.

Rate of Superphosphate per acre.	Computed Yields per acre. 1.	2.	3.	Average 1924.	Percentage 1924.	Average Yields 1923.	Average 1923–24.	Percentage 1923–24.
	C. Q. L.	C. Q. L.	C. Q. L.	C. Q. L.	%	C. Q. L.	C. Q. L.	%
150lbs.	26 1 12	23 1 24	22 2 24	24 0 13	110	24 2 27	24 1 20	116
75lbs.	23 1 4	20 1 4	22 0 24	21 3 20	100	19 3 17	20 3 19	100
225lbs.	23 1 4	20 2 24	*	22 0 0	100	28 2 10	25 1 5	120

* The yield was so obviously affected by outside sources that it was unsuitable for comparison, and therefore discarded.

GRAIN YIELDS.

Rate of Superphosphate per acre.	Computed yields per acre. Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.	Average 1924.	Percentage 1924.	Average Yields 1923.	Average 1923–24.	Percentage 1923–24.
	bus. lbs	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	bus. lbs.	bus. lbs.	%
150lbs. ...	19 55	22 24	22 32	21 28	22 48	21 50	106	21 4	21 27	109
75lbs. ...	20 0	20 48	20 48	20 24	21 4	20 37	100	18 34	19 36	100
225lbs. ...	21 28	21 55	22 0	22 16	21 44	21 53	106	21 23	21 38	110

To date the results indicate that the yields of both grain and hay are increased by the application of the larger amounts of fertiliser.

LATE SEEDING EXPERIMENT.

This experiment, as in last year, was planted so that the plots were seeded about the middle of May, June, and July respectively. The area of each plot was one-eighth of an acre, and repeated three times.

During early December a fire started on an adjoining farm, spread to the farm and destroyed a large area of the standing crop, including this experiment. In consequence no yields for this year are available. Fortunately a photograph of this experiment was taken in early October, and the effect of the later planting may be judged from the illustration herewith, made from that photograph.

After the photograph was taken good rains enabled the June and July plantings to mature under favourable circumstances, but from observations it did not appear as if either would equal the yield of the May planting. The July planting was considerably below that of the June planting.

The results of last year's planting are shown hereunder. These show that May is the best month for planting in this district.

TABLE C.—LATE SEEDING EXPERIMENT, 1923.

Variety: Gluyas Early.

Seed, 45lbs. per acre. Superphosphate, 112lbs. per acre.

Planted.	Computed Yields.			Average.	Per cent.
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%
May 15th	20 30	21 29	24 34	22 11	100
June 12th	18 31	18 16	16 12	17 40	79
July 10th	12 50	15 48	15 10	14 36	66

Late Seeding Experiment, Chapman Experiment Farm, 1924.

FIELD EXPERIMENTS WITH WHEAT AT THE MERREDIN EXPERIMENT FARM.

J. H. LANGFIELD, Farm Manager.

The season was good; light rains came at opportune times and kept the crops growing. The rainfall, however, was not heavy enough to provide moisture reserves in the soil, and in consequence a very anxious time was experienced because of the scarcity of rain in September. This was eventually offset by the good rains which fell after the middle of October.

The results of last year's planting are shown hereunder; these show that May is the best month for planting in this district:—

MERREDIN EXPERIMENT FARM.

Rainfall (1924) in points.

Jan.	Feb.	Mar.	April.	Growing Period.						Total. May-Oct.	Nov.	Dec.	Total for 1924.
				May.	June.	July.	Aug.	Sept.	Oct.				
Nil	38	70	46	177	200	94	179	89	154	893	47	7	1,101

LATE SEEDING EXPERIMENT.

The object and other particulars relating to this experiment were published in the April issue of this *Journal*. The experiment was first conducted in 1923; and this year's results are very similar to those obtained last season,

Late Seeding Experiment, Merredin Experiment Farm, 1924.

which go to prove that in districts with climatic conditions similar to Merredin, the yield from wheat sown later than May has a gradual decline.

This season the splendid rains that fell during October suited the late-sown crops, and the good yield of the July planting is mainly due to this.

The yields of both the June and July plots are better than should be expected in an average year, when the rainfall is usually light during the month of October.

The land for this experiment was fallowed in June, cultivated in September, and worked to a good seed-bed before planting. The June plot received one and the July plot two cultivations after the May plot was sown; all plots were harrowed after the drill.

The variety of wheat used was Gluyas Early, and was seeded at the rate of 60lbs. per acre, superphosphate being applied at the rate of 112lbs. per acre.

The results obtained this year, together with the two years' average, are as follow—

MERREDIN.

Late Seeding Experiment, 1924.

Grain Yields.

Time of Seeding.	Computed yield per acre.			Average 1924.	Percentage 1924.	Average 1923.	Average 1923-24.	Percentage 1923-24.
	Section 1.	Section-2.	Section 3.					
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	bus. lbs.	bus. lbs.	%
June 16th ...	27 28	27 44	28 48	28 0	90·5	27 33	27 24	85·2
May 17th ...	30 32	30 32	33 4	30 56	100·0	34 13	32 32	100·0
July 14th ...	20 16	20 10	20 16	20 8	65·1	15 47	17 52	55·0

RATE OF SUPERPHOSPHATE EXPERIMENT.

This experiment was first conducted in 1923, and the results this year are very similar to those obtained last season.

The experiment was carried out on heavy salmon gum and gimlet country; it was fallowed in June, cultivated with a springtooth cultivator in September, the disc cultivator was put over it in March, and it was harrowed after early April rains in order to conserve moisture and assist in germinating weeds. It was again cultivated with a springtooth cultivator before planting to bring it to a good seed-bed.

It was planted on 7th May with 60lbs. seed, and superphosphate at the rate shown on the table.

Soon after germination the plots that received the heavier dressings of superphosphate showed the more vigorous growth, and this was maintained up to the time the crop came into ear, the plots receiving 225lbs. superphosphate appeared thicker and to produce more foliage, whilst the 150lb. plot was thicker and more vigorous than the one receiving 75lbs. The rate of application also influenced the maturity of the crop, the heavier the dressing the earlier did the crop mature. The more heavily manured plots were also inclined to lodge much more than the lighter ones. This may have been due to the heavier growth of flag and straw which they carried.

The results this season show a decided increase for the additional fertiliser when applied to the hay crop, an extra 75lbs. producing 25 per cent. more hay, whilst an extra 150lbs. produced 31 per cent. more. The difference

is not so great with the grain crop, the extra 75lbs. of superphosphate producing eight per cent., and the 150lbs. extra produced 17 per cent. more. When this year's results are averaged with those of last season, they show an increase of 14 per cent. of 75lbs. of extra superphosphate and 18 per cent. for 150lbs. extra in the hay yield; whilst in the grain yield the increase is 10 and 15 per cent. respectively.

From results already obtained it indicates that an increase in yield of both hay and grain is obtained from the increased quantity of superphosphate, and whilst in some seasons it may pay to increase the quantity to two cwt., our results to date go to show that the most economical dressing would be 150lbs.

The detailed results, together with the average for the last two seasons, are given herewith:—

MERREDIN EXPERIMENT FARM.

Rate of Superphosphate, 1924.

GRAIN YIELDS.

Rate of Superphosphate per acre.	Computed yields per acre.										Average 1924.	Percentage 1924.	Average 1924.	Average 1923–24.	Percentage 1923–24.
	Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.						
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus. lbs.	%	bus.	lbs.	bus. lbs.	%
150lbs.	28	32	30	24	32	16	30	32	32	0	30 40	108·5	34	33	32 41	110·1
75lbs.	28	56	28	8	29	4	28	32	26	32	28 16	100	31	4	29 40	100
225lbs.	32	40	34	56	34	40	31	36	32	8	33 12	117·4	35	18	34 15	115·4

HAY YIELDS.

Rate of Superphosphate per acre.	Computed yield per acre.						Average 1924.	Percentage 1924.	Average 1923.		Average 1923–24.		Percentage 1923–24.
	Section 1.		Section 2.		Section 3.								
	C.	Q. L.	C.	Q. L.	C.	Q. L.	C. Q. L.	%	C.	Q. L.	C.	Q. L.	%
150lbs.	68	0 0	72	2 16	66	2 24	68 1 20	125	56	2 17	62	2 4	114·4
75lbs.	55	2 44	55	0 24	53	0 24	54 2 24	100	54	2 5	54	2 14	100
225lbs.	73	3 20	72	1 4	70	1 4	72 0 16	131·9	57	0 11	64	2 13	118·2

RATE OF SEEDING EXPERIMENT.

As in previous years this experiment was carried out with two varieties —a free-stooling mid-season and a sparse-stooling and early variety.

The rates of seed were 30, 45, and 60 lbs. per acre in both cases. The land was fallowed in June, cultivated in September; it was worked to a good seed-bed before planting. Superphosphate was used at the rate of 84 lbs. per acre; this being the same as applied to the main crop. The varieties of wheat used where "Nabawa," to represent a free-stooling variety, and "Florence," to represent a sparse-stooler; the plots are repeated eight times, three being harvested for hay and five for grain.

Details of the results of this years' experiments will be seen in the following table:—

MERREDIN EXPERIMENT FARM.

RATE OF SEEDING EXPERIMENT, 1924.

Grain Yields.

Midseason Variety "Nabawa," planted 27th May, 1924.

Lbs. of Seed per acre.	Computed yields per acre.										Average 1924.		Per-centage 1924.	Average previous years.		Average 1913–24.		Per-centage 1913–24.
	Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.									
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	%	bus.	lbs.	bus.	lbs.	%
30lbs. ...	29	36	30	32	31	12	32	40	31	28	31	4	98·7	19	55	20	55	95·0
45lbs. ...	31	28	31	36	30	32	33	4	30	48	31	28	100	21	4	22	1	100·0
60lbs. ...	29	52	31	28	32	24	34	8	32	8	32	0	101·7	20	40	21	42	98·6
Early Variety "Florence," planted 29th May, 1924.																		
30lbs. ...	22	24	22	48	23	20	24	8	26	8	23	44	96·7	20	43	20	59	97·6
35lbs. ...	22	32	22	16	23	36	25	52	28	40	24	32	100	21	12	21	30	100·0
60lbs. ...	21	52	24	8	25	28	26	32	27	28	25	4	102·1	21	7	21	29	100·0

The heavier seeding gave practically no better results from either the sparse or free stooling varieties. In the hay section the 45lbs. rate gave the best yields, but here again by a narrow margin only.

Rate of Seeding Experiment, Merredin Experiment Farm, 1924.

Experiments conducted by the Chapman Experiment Farm, and also by many farmers, include a rate of seeding experiment, the different rates of seeding of which are 45, 60, and 90 lbs. per acre. To make uniformity in this respect the Merredin Experiment Farm enlarged their experiment to

include these rates of seeding; the mid-season variety "Nabawa" only being used. The tabulated results of the experiment are hereunder:—

RATE OF SEEDING EXPERIMENT, 1924.

Midseason Variety, "Nabawa," planted 17th April, 1924.

GRAIN YIELDS.

Lbs. of Seed per acre.	Computed Yield per acre.										Average 1924.		Percentage 1924.
	Section 1.		Section 2.		Section 3.		Section 4.		Section 5.				
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	%
60lbs.	26	40	29	20	31	20	29	28	30	48	29	28	103·7
45lbs.	25	28	29	12	29	4	28	32	30	8	28	24	100·0
90lbs.	28	24	32	16	28	56	31	28	32	0	30	32	107·5

HAY YIELDS.

Lbs. of Seed per acre.	Computed Yield per acre.									Average 1924.			Percentage 1924.
	Section 1.			Section 2.			Section 3.						
	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	%
60lbs.	42	1	4	43	0	0	47	0	8	44	0	8	98·8
45lbs.	44	0	0	43	3	4	46	0	8	44	2	8	100·0
90lbs.	44	1	20	46	2	24	46	1	4	45	3	4	102·6

It will be noticed that the heavier quantities of seed gave slightly better results. This may have been due to its being sown early, thus allowing for a longer period for stooling and development. This is not in accordance with the generally accepted theory amongst farmers, who usually advise increasing the amount of seed for later planting.

FOREST PESTS.

The Pin-hole borer (Atractocerus Kreuslerae, Pasc.)

J. Clark, F.L.S.,
Assistant Economic Entomologist.

Probably no insect does greater damage to the commercial timber growing in Western Australian forests than the pin-hole borer.

Although only too well known in the larval state, the imago, or adult stage, of this insect has only lately been discovered. Various attempts have been made to rear the larvæ to maturity, both in the laboratory and in the field, but all attempts to do so failed until January of the present year.

For some years it has been the aim of the Entomological Branch to capture these beetles by means of fine brass-wire gauze traps nailed securely over a portion of various trees containing pin-hole borers, but until recently little success attended these efforts, owing mainly to bush fires and inquisitive, or mischievous, individuals who destroyed the traps.

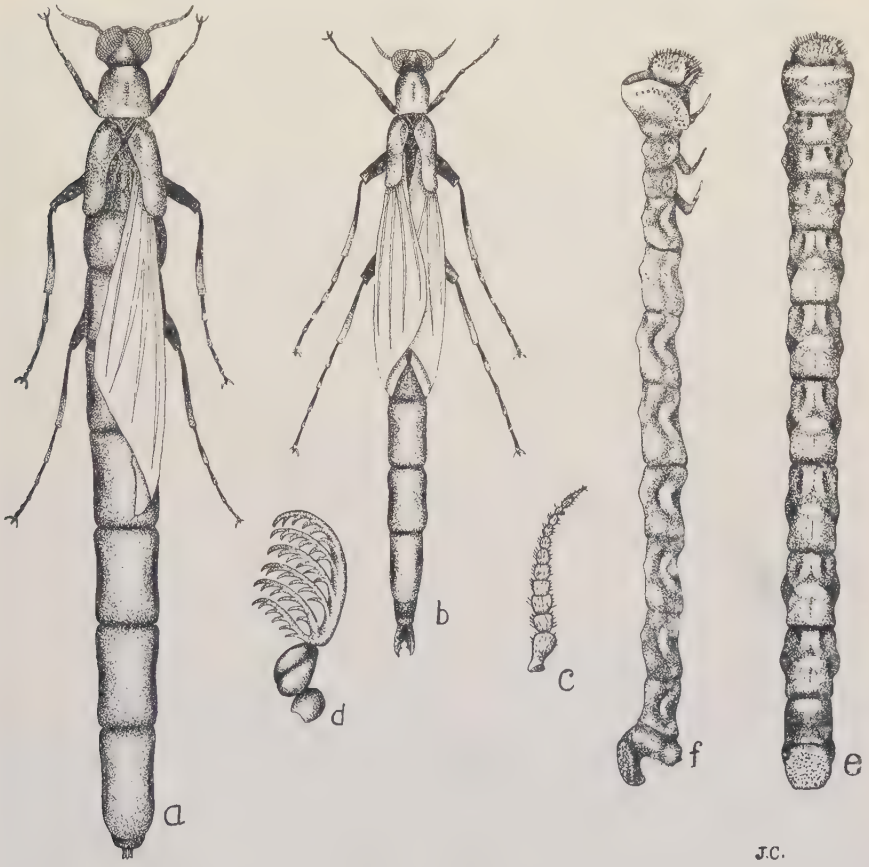
In February of last year traps in the Mundaring district were examined, one was found to contain a large amount of insect remains and several small, empty, pupal cases. The remains of the insects were so fragmentary, owing to the ravages of small Ants (*Pheidole*), as to render their identification impossible, but from the appearance of the long thin legs, palpi and pupal cases, it was considered that these were the remains of small boring moths. The trap had been attached to the tree for 12 months, and except for the very small ants, no insects could enter without emerging from the larval burrows. As all our traps on this area were about this time destroyed by a disastrous bush fire, our efforts were centred on pin-hole borer traps attached to Tuart trees on the Ludlow Tuart Reserve.

Four traps were attached to trees containing very active colonies of borers in May, 1923, and were kept under observation as much as possible, efforts being made to examine them at regular intervals. During the later part of last year it was found that one of these traps had been torn off, but the other three were intact and the larvæ working strongly.

On my last visit to these traps in the middle of January this year, I was surprised to find that the area containing the traps had been burned out, and that the two lower traps had been badly burned, but the upper trap appeared not to have been touched by the fire. An examination of the undamaged trap revealed two live and remarkable beetles, the adults of the pin-hole borer. These belong to the wood-boring family *Lymexylonidae,* and have been identified, with little doubt, as *Atractocerus Kreuslerae* (Fig. I, a, b). The trap was removed from the tree, and, with the aid of an axe I was able to obtain a large number of the insect in various stages of development, but the majority had left the pupal case and were lying at the front edge of the burrow ready to emerge. Having cut out all that were covered by the trap, I explored many trees in the district which contained pin-hole borers, and had the satisfaction of finding the adults present in every case.

This is the first record of this insect being so numerous in this State, although there is at present a single female in the Western Australian Museum, taken at Guildford in 1915. During January of the present year

Mr. L J. Newman captured a single male example near Claremont, on reeds. It seems remarkable that an insect whose larvæ is so abundant in our trees should be so rare and practically unknown in our State collections, but from observations of this beetle, during January of this year, it is not surprising that it remained so long unknown. The perfect beetle, unlike most



A.—*Atractocerus Kreuslerae*, Pasc; female, enlarged; one wing removed to show segments.
B.—*Atractocerus Kreuslerae*, Pasc; male, enlarged.
C.—Right antenna of the male, greatly enlarged.
D.—Right palpus of the male, greatly enlarged.
E.—Dorsal view of larva, enlarged.
F.—Lateral view of larva, enlarged.

insects, does not wait outside the burrow for its wings to harden in order that it can fly away, it flies off at the moment it is clear of the entrance and sails right up to the top of the tree so quickly that one can scarcely watch it go.

When on the wing this beetle is remarkably like one of the small Neuropterus insects, and even at rest it is easily mistaken for a May Fly or other Neuropteron.

The family to which this beetle belongs is world wide in its distribution, but is most abundant in the tropics. Eight species have been described from Australia and Tasmania, but so far as I can find nothing has been published regarding their life history, except perhaps, a small note by Mr. A. M. Lea, in which he says, of *Atractocerus victoriensis*, "three specimens were taken

Portion of tree trunk infested with the pin-hole borers.

out of piles in the Moe River, at Yarragon, by Mr. W. Kershaw." Most of the species appear to have been captured at lights at night.

The type of the present species was described by Pascoe in 1864, from specimens captured in South Australia, but nothing was known regarding its habits, the following notes may therefore be of interest. The eggs are deposited on the bare injured timber of the tree, generally on the seat of an old blaze mark, or in gaps cut into the trees by wood cutters, or where limbs have been torn off. Almost any Eucalypt in the bush with a portion of the trunk injured is liable to attack, but the species of trees are favoured in the following order:—Blackbutt (*Euc. patens*), Tuart (*Euc. gomphocephala*), Jarrah (*Euc. marginata*), Wandoo (*Euc. redunca, var. elata*), Flooded Gum (*Euc. rudis*), Marri (*Euc. calophylla*). A striking feature in connection with the borer and the Tuart is that it is frequently found working in old stumps and old logs lying on the ground. I have not found this to be the case with the other trees, although on rare occasions I have seen the borer active in dead Wandoo, which was still standing with suckers attached.

The larvæ, which measures up to 35 m.m., or 1½ inches, is of a light cream colour, with the head and cowl yellowish. A few short, erect, yellowish hairs on the head, cowl, and terminal segment of the body, longer and bristle-like on the legs, the rest of the body without hairs.

Head small, rounded above and on the sides; the mandibles long and sharply pointed; eyes absent; antennæ vestigial; three-jointed; palpi long and broad, with a row of large bristle-like hairs on the inner edge. The first segment of the body is raised and produced upward and forward somewhat in the form of a cowl; on the sides near the front edge there is a row of raised punctures, these are effaced on top. The second and third segments are short, much shorter than the others, and have on each side a strong tubercule on the apex of which the spiracles are placed. The peculiar wrinkling of the fourth to the tenth segments give the appearance in many examples as though the segments were double, in some examples the wrinkles are feeble. The terminal segment is the most remarkable, this is strongly raised upward and arched backward, with the top flat, and pitted with moderately large punctures; this segment can properly be termed hook-shaped; in front below the segment is produced downward with the bottom edge broad, the anus is placed in the middle of this edge. There is a faint indication of a joint about one-third of its height from the bottom. The legs are somewhat rudimentary, and are armed with one strong sharp claw; the legs are of no use to the insect when placed on a flat surface, but no doubt would be of much use in assisting its movements in the burrow, they appear to be fixed in a forward direction, and to possess little power of movement.

The larvæ bore for a considerable distance into the tree, mostly in a horizontal direction, but frequently upwards or downwards, and very often in all directions.. As the larvæ progress inwards they continualy push out a long thread-like core, which is usually projecting about one inch from the burrow, eventually breaking off and accumulates in a heap at the base of the tree, or the injured portion; this thread-like core is very characteristic of the pin-hole borer. No doubt the peculiar terminal segment is adapted for ejecting this material, the short forward-bent legs giving it great power to push the core along the burrow.

When fully grown the larvæ appears to turn in the burrow and work back to the entrance, the tunnel being greatly enlarged, the core being packed tightly behind as it works along. The entrance to the burrow is plugged and the larva pupates close to the surface, usually from a quarter to half an inch inward. In many cases the pupal case is cast off inside the burrow, but on several occasions I have found the empty case projecting half an inch from the entrance to the burrow. The pupa is enclosed in a transparent envelope, the insect being clearly visible within.

The males are much smaller than the females, but occasionally large males and small females are found. The males recently taken measure from 17 m.m. to 23 m.m., and the females from 25 m.m. to 31 m.m. They are of a dingy brown colour, with the hind wings transparent (Fig. 1, a, b). The eyes are large and close together. The antennæ are short, eleven-jointed, with the last joint longer than the two preceding joints together, it appears to be composed of two joints fused together. The palpi are very large and of peculiar shape (Fig. 1, d); they are much larger in the male than in the female. In the figure only the right half of the right palpus is shown, the terminal pectinations being double. The wing covers are very short, they are three times longer than broad near the base; the hind wings very long and narrow. The legs are long and thin, those of the male being much longer than those of the female; in both sexes they are armed with long sharp claws.

The speed with which this beetle takes to the wing is remarkable, for it is no sooner out of the burrow than it is off. This is greatly assisted by the abnormally short wing covers, and the comparatively long hind wings.

The actual time passed by the larvæ in the tree is not definitely known, but they spend at least two years in the larval state. This fact we know from the traps on the Tuart trees at Ludlow, but the borers had been at work for some time before the traps were attached.

Experiments are now being conducted with a view of obtaining the exact length of time taken to reach maturity from the egg, and for this purpose fertile females have been imprisoned in traps on trees.

No parasites have been observed in connection with this insect, but the larva appears to be liable to the attacks of a fungus which at times fills up the burrow and destroys the insect.

This pest, being so wide-spread and having so many hosts, could not be economically controlled by artificial means.

METEOROLOGICAL INFORMATION.

1924-25.

Stations.	Temperature.				Rainfall.		Temperature.				Rainfall.		Temperature.				Rainfall.	
	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.
	Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.		
	NOVEMBER, 1924.						DECEMBER, 1924.						JANUARY, 1925.					
					inches.	inches.					inches.	inches.					inches.	inches.
Chapman State Farm	81·8	109·5	53·3	40·8	·53	·20	...	...	63·0	52·4	·03	·18	91·4	105·0	62·6	52·4	·35	·31
Geraldton	77·8	103·3	58·4	51·0	·38	·25	86·6	112·0	64·7	52·4	·05	·13	84·2	101·0	65·6	55·0	·54	·23
Walebing	82·2	100·0	50·8	38·2	1·11	·51	90·3	108·0	60·3	51·0	·25	·47	87·8	109·2	59·8	45·3	·83	·34
Perth	74·7	93·6	55·8	47·8	2·61	·73	83·2	96·6	60·3	49·3	*Nil*	·59	83·3	95·0	61·4	48·6	·65	·35
Kalamunda	73·6	92·7	54·2	45·3	2·58	1·04	84·9	99·6	57·9	45·4	*Nil*	·94	82·9	97·6	58·8	47·0	·80	·54
Bunbury	73·4	94·2	53·6	44·8	1·67	1·04	81·3	90·2	56·1	44·5	·06	·61	82·6	93·8	57·6	44·2	·60	·45
Bridgetown	72·2	90·3	47·9	40·8	2·58	1·12	81·4	95·2	50·3	37·8	*Nil*	·82	81·6	98·9	52·3	38·0	1·06	·55
Albany	67·8	86·0	53·0	46·0	2·48	1·34	71·7	81·0	56·6	51·0	·23	1·13	72·9	91·6	59·4	49·0	1·50	·73
Merredin State Farm	81·0	102·0	52·1	42·8	·47	·42	89·8	104·9	59·8	45·6	·07	·72	84·1	106·1	59·1	45·0	2·35	·55
Northam	80·5	101·2	52·5	41·2	·64	·38	91·3	108·8	60·4	49·3	*Nil*	·37	87·7	107·5	60·4	45·1	1·85	·27
York	80·3	98·8	51·9	41·2	·58	·43	91·0	108·6	58·5	47·0	*Nil*	·46	87·3	108·1	59·1	43·8	1·97	·30
Narrogin State Farm	75·3	94·5	47·3	38·4	·79	·59	84·9	101·0	53·1	39·4	·52	·58	82·6	104·5	54·6	42·3	·63	·33
Katanning	73·0	90·4	48·1	39·0	1·08	·64	82·1	101·0	52·1	41·3	*Nil*	·55	80·9	103·1	53·8	41·0	·41	·38
Cape Leeuwin ...	66·3	92·0	57·6	51·0	2·73	1·23	71·7	83·2	60·9	55·0	·09	·93	74·2	79·0	63·3	50·0	·79	·67

LIVE STOCK AND MEAT.

For the information of readers of the *Journal*, the following particulars have been supplied by Elder, Smith & Co., Limited, Perth:—

Comparative Yardings of Stock at Metropolitan Fat Stock Markets during months of December, 1924, and January and February, 1925.

	DECEMBER, 1924.				JANUARY, 1925.				FEBRUARY, 1925.			
	3.	10.	17.	30.	7.	14.	21.	28.	4.	11.	18.	25.
Sheep & Lambs	10,047	9,573	14,367	8,859	20,540	17,160	11,874	12,144	7,864	7,906	8,162	7,931
Cattle	644	744	872	634	717	747	496	606	607	610	531	592
Pigs	428	525	10,057	551	611	862	777	1,087	792	809	579	770

Comparative Values of Stock sold at Metropolitan Fat Stock Markets during months of December, 1924, and January and February, 1925.

	DECEMBER, 1924.				JANUARY, 1925.				FEBRUARY.			
	3.	10.	17.	30.	7.	14.	21.	28.	4.	11.	18.	25.
Mutton ...	s. d. 0 11	s. d. 0 11¾	s. d. 1 1	s. d. 1 0½	s. d. 1 0½	s. d. 1 0	s. d. 0 11¾	s. d. 1 0	s. d. 1 0	s. d. 0 11½	s. d. 0 11	s. d. 0 11
Beef	0 7¾	0 7¾	0 7¾	0 7¾	0 7¾	0 7¼	0 7½	0 7¾	0 7¾	0 7¾	0 7¾	0 8
Pork	0 11½	1 0	0 11½	1 0	1 0¼	1 0¼	1 0¾	1 0½	1 0	0 11½	0 11½	0 11½
Bacon	0 10	0 10	0 9¾	0 9¾	0 10	0 10½	0 11½	0 11	0 10¾	0 10¾	0 10¾	0 10½

In the comparative yardings of stock it is interesting to note the high figures quoted for the month of January, the sheep and lambs on the 7th and 14th being 20,540 and 17,160 respectively, which, it is understood, constitute record dealings.

MARKET REPORT.

Wheaten Chaff.—The following particulars of the approximate quantity of both wheaten and oaten chaff at the Metropolitan Chaff and Grain Auction Sales, held in Perth during the months of December, January, and February, also the minimum and maximum prices ruling for f.a.q. to prime quality wheaten chaff during those months, have been kindly supplied by Messrs. H. J. Wigmore & Co., Perth:—

December: Quantity—2,450 tons.
Minimum price for f.a.q. to prime—£5 12s. 6d. per ton.
Maximum price for f.a.q. to prime—£6 15s. per ton.

January: Quantity—1,900 tons.
Minimum price for f.a.q. to prime—£6 per ton.
Maximum price for f.a.q. to prime—£7 17s. 6d. per ton.

February: Quantity—2,400 tons.
Minimum price for f.a.q. to prime—£6 15s. per ton.
Maximum price for f.a.q. to prime—£7 5s. per ton.

It will be seen that in January supplies were light, the chief reason being the acute shortage of trucks, and on the 14th January the top price of £7 17s. 6d. per ton was obtained. For several days around that date the market was hovering at from £7 5s. to £7 15s. per ton, but towards the end of the month, after repeated application to the Railways to supply trucks, fairly large rakes were put in at various sidings in order to clear up chaff stacked on the ground, and this resulted in an easing in values. However, the truck position again became very acute, and supplies began to dwindle, the market gradually firming, and on the 14th February the market stood at £7 5s. Since then rather better supplies have been arriving, and at time of writing this report (4th March) the value of f.a.q. to prime is from £6 15s. to £7 per ton. Owing to the shortage of trucks stated above, a considerable quantity of chaff stacked at cutters and railway sidings got caught in the recent heavy rains, with the result that considerable damage was done. Practically all the damaged chaff found its way to the Perth market, and for a few days damaged or partly damaged consignments were very hard to quit at low figures.

Oaten Chaff.—Although in December and January supplies were scarce, towards the latter end of February considerable quantities found their way to market, and at time of writing fair average quality is realising around £5 10s. per ton, and mediums from £5 to £5 2s. 6d., with occasionally a prime consignment realising £6 per ton.

Oats.—Supplies have been plentiful, and the market is exceedingly dull, good heavy feeds selling at from 2s. 10½d. to 3s. per bushel.

Wheat.—The highest price obtained under the hammer during the above-mentioned period was 7s. per bushel, but at time of going to press the market for f.a.q. is 6s. 6d. per bushel, smutty and inferior samples readily finding buyers at prices according to quality.

WESTERN AUSTRALIA—DEPARTMENT OF AGRICULTURE.

List of Bulletins available for Distribution.

No. 20.—"The Pruning of Fruit Trees." By J. F. Moody. Price 2s. 6d.
No. 46.—"Fruit Packing and Marketing and Exporting of Fruit." By J. F. Moody and J. Ramage. Price 1s. 6d.
No. 47.—"The Poultry Keeper's Manual." By G. Allman. Price 1s.
No. 83.—"Horticulture and Viticulture." By A. Despeissis. Price 2s.
No. 5.—"Fruit Drying." By J. F. Moody. Free.
No. 15.—"Root Rot." By A. J. Despeissis. Free.
No. 49.—"The Feeding of Horses." By Professor Paterson and G. L. Sutton. Free.
No. 57.—"Vermin Destruction." By A. Crawford. Free.
No. 60.—"The Farmer's Clip." By J. J. Mahood. Free.
No. 68.—"Flaying and Treatment of Hides." By R. E. Weir. Free.
No. 72.—"The Potato: Its Cultivation, Pests and Diseases." By G. N. Lowe, L. J. Newman, D. A. Herbert. Free.
No. 74.—"Tobacco Growing: Notes for Intending Planters." By G. W. Wickens. Free.
No. 79.—"Sheep on the Wheat Farm and their Management in W.A." By H. McCallum. Free.
No. 87.—"Sheep Feeding Experiments: State Farm, Chapman, 1920." By G. L. Sutton and F. Vanzetti. Free.
No. 88.—"Light Land: Conference." By G. L. Sutton. Free.
No. 90.—"Stock Waters: Standard for Composition of." By E. A. Mann. Free.
No. 93.—"The Home Tanning of Sheep and other Skins." By H. Salt. Free.
No. 94.—"The Dingo." By B. W. Leake. Free.
No. 96.—"Poison Plants of W.A." By D. A. Herbert. Free.
No. 99.—"Australian White." By G. L. Sutton. Free.
No. 101.—"Cotton Cultivation." By G. L. Sutton. Free.
No. 103.—"Kerosene Method for Eradicating Zamia Palm." By G. K. Baron-Hay. Free.
No. 104.—"Stickfast Flea." By J. G. C. Campbell. Free.
No. 105.—"Pedigree Selection of Seed." By G. L. Sutton. Free.
No. 106.—"The Red Legged Velvet Earth Mite." By L. J. Newman. Free.
No. 107.—"Sudan Grass." By G. L. Sutton. Free.
No. 109.—"Rape." By G. L. Sutton. Free.
No. 111.—"Standard Wheat Varieties." By G. L. Sutton and F. Vanzetti. Free.
No. 112.—"Automatic Device for Eradication of Stickfast Flea." By G. Allman. Free.
No. 113.—"Picked Pieces (Classification of Clip)." Free.
No. 114.—"Blue Mould on Citrus Fruits." By W. M. Carne. Free.
No. 115.—"The Value of Windmills for pumping water in W.A." A. H. Scott.
No. 116.—"Spotted Wilt of Tomatoes." W. M. Carne.
No. 117.—"Cream." P. G. Hampshire.
No. 118.—"Pigs and Pig Raising." P. G. Hampshire.
No. 119.—"Take-all of Wheat and Similar Diseases of Cereals." By W. M. Carne and J. G. C. Campbell.
No. 120.—"Pastures in the South-West." A. B. Adams. (Reprint from "Journal.")
No. 121.—"Mildew, Septoria, Leaf Spots, and Similar Diseases of Cereals." W. M. Carne and J. G. C. Campbell.
No. 122.—"Fruit-fly. Description and Control." L. J. Newman.
No. 124.—"Government Inspection of Wheat." G. K. Baron-Hay. (Reprint from "Journal.")
No. 125.—"Buy Good Seed." (Advice to Farmers.) W. M. Carne. (Reprint from "Journal.")
No. 126.—"The Rust of Cereals." W. M. Carne and J. G. C. Campbell.
No. 127.—Wheat Yields—Competitions.
No. 128.—"Woolly Aphis Parasite (*Aphelinus mali*)." (Hald.) L. J. Newman. (Reprint from "Journal.")
No. 129.—"The Farm Horse: Hints on Feeding." A. McK. Clark. (Reprint from "Journal.")
No. 130.—"Minerals and the Health of Cattle." A. B. Adams. (Reprint from "Journal.")
No. 131.—"The Strength of Wheat and Flour." R. G. Lapsley. (Reprint from "Journal.")
No. 133.—"Kikuyu Grass for Poultry." G. L. Sutton. (Reprint from "Journal.")
No. 134.—"Flag Smut of Wheat." W. M. Carne. (Reprint from "Journal.")

No. 135.—"The Objects of Farmers' Trials." G. L. Sutton. (Reprint from "Journal.")
No. 136.—"The Use of the Scythe." H. Campbell. (Reprint from "Journal.")
No. 137.—"Winter Trapping of the Fruit-fly." L. J. Newman. (Reprint from "Journal.")
No. 138.—"Clearing Heavily-timbered Pastures." A. B. Adams. (Reprint from "Journal."
No. 139.—"Ants as a Domestic Pest." J. Clark. (Reprint from "Journal.")
No. 140.—"Surface Drainage." A. R. Clifton. (Reprint from "Journal.")
No. 141.—"Breeding a Permanent Flock." H. McCallum. (Reprint from "Journal.")
No. 142.—"The Plague Locust." L. J. Newman. (Reprint from "Journal.")
No. 143.—"Zamia Palm and 'Rickets' in Cattle—Method of Eradication." A. B. Adams and G. K. Baron-Hay.
No. 144.—"Ants as Pests." J. Clark. (Reprint from "Journal.")
No. 145.—"The Tuart Bud Weevil." L. J. Newman and J. Clark. (Reprint from "Journal.")
No. 146.—"The Development of a Dairy Herd" (3). P. G. Hampshire. (Reprint from "Journal.")
No. 147.—"Cultivation of the Potato." G. N. Lowe. (Reprint from "Journal.")
No. 148.—"Maize—The King of Fodder Crops." G. L. Sutton. (Reprint from "Journal.")
No. 149.—"Lucerne—The Queen of Fodder Crops." G. L. Sutton. (Reprint from "Journal.")
No. 150.—"Subterranean Clover." A. B. Adams. (Reprint from "Journal.")
No. 151.—"Blow Fly Traps." L. J. Newman. (Reprint from "Journal.")
No. 152.—"Bee Diseases." H. L. Cailes. (Reprint from "Journal.")

The following publications may be obtained from the Department of Agriculture, Perth, on application, or will be sent post free to any address in this State on receipt of a remittance for the amounts stated:—

"The Handbook of Horticulture and Viticulture of Western Australia," by A. Despeissis, M.R.A.C.:

This publication contains valuable information dealing with all commercial fruits grown in Western Australia, including advice on planting, pruning, packing, manuring, fruit-drying, wine-making, insect and fungoid pests and their treatment, etc., and the whole forms a text book which every fruitgrower, whether large or small, should have in his possession. The price originally was 8s. 6d., but to allow of distribution being as wide as possible, it has been reduced to 2s.

"The Pruning of Fruit Trees," by J. F. Moody, Fruit Industries Commissioner:

This publication contains numerous illustrations, being reproduction of photographs taken in this State, of pruned and unpruned trees, which make the details set out in the letterpress particularly easy to understand. Price, 2s. 6d.

"Fruit Packing and the Marketing and Exporting of Fruit," by J. F. Moody, Fruit Industries Commissioner, and J. Ramage, Packing Instructor:

This publication contains invaluable information on packing and grading fruit for local and export markets. It is freely illustrated, and no fruit-packing shed should be without a copy. Price, 1s. 6d.

"The Poultry-keepers' Manual," by George Allman, Government Poultry Expert:

This is a most useful and valuable book, not only for beginners, but to all those who keep fowls for pleasure or profit. It deals fully with all matters connected with the industry, including Breeding, Feeding (for stock birds or egg production), Incubating, Brooding and care of chicks, Marketing (eggs and poultry), and all matters of use to the poultry-keeper. It also fully describes symptoms of various ailments and diseases and simple treatment for same, and, as the book was written to suit *Local Conditions*, every poultry-keeper should have a copy by him. Price, 1s.

By Authority: FRED. WM. SIMPSON, Government Printer, Perth.

Telegrams : "MILLARS' TIMBER." Telephones : Perth, Nos. A4141 to 4146.

MILLARS'

TIMBER AND TRADING Co. Ltd.

TIMBER AND HARDWARE MERCHANTS

BRANCH YARDS IN ALL COUNTRY TOWNS FULLY STOCKED WITH LARGE ASSORTMENT OF TIMBER, HARDWARE, AND SUNDRY LINES

COUNTRY YARDS :

Albany
Bunbury
Bruce Rock
Beverley
Claremont
Geraldton
Goomalling
Kalgoorlie
Kellerberrin
Narrogin
Narrembeen
Maylands
Moora
Midland Junction
Northam
North Fremantle
Pingelly
Subiaco
Victoria Park
Wagin
Wyalkatchem
York

SPECIALTIES : Jarrah Timber (all sizes and lengths), Jarrah Silos, Circular Jarrah Tanks, Jarrah Cottages (Settlers'), Jarrah Fencing Droppers, Jarrah and Karri Fruit Cases, Building and Agricultural Lime, Spraying Lime, Ground Lime, Building Stone and Sand, Cement, Plaster and Plaster Board, and Builders' Hardware

JOINERY WORK of all descriptions executed at Shortest Notice. ::: ::: Estimates Free

AGENTS IN WESTERN AUSTRALIA :

Paraffine Co.'s Malthoid Roofings, P. & B. Paints, etc. ; Roger's (Detroit) Paints, Enamels, etc.

Correspondence invited. Prices on application.

HEAD OFFICE:

Saint George's House, Perth

WORKS : LORD STREET, PERTH.